OCTOBER 1970

rsc

RAILWAY SYSTEM CONTROLS

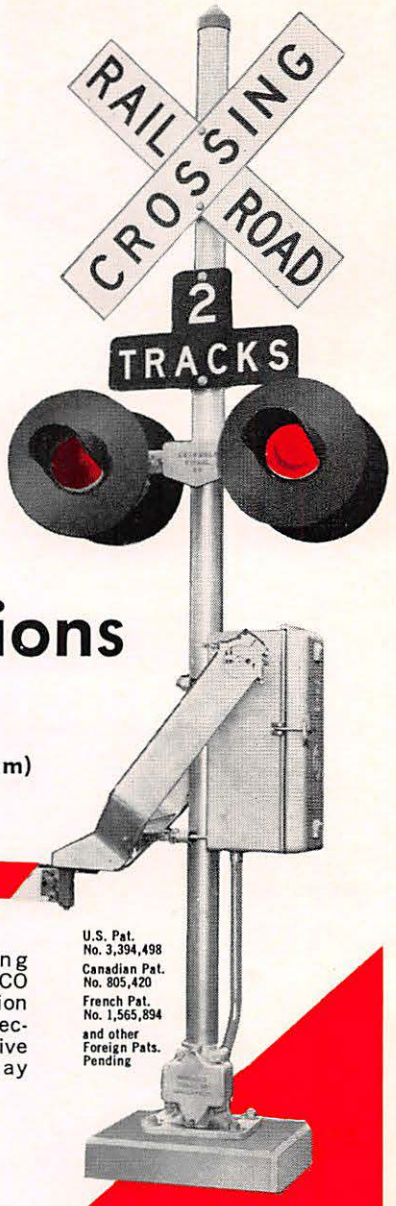
# Communications men go to school

CF73 G 55
R R TAYLOR
40 WEST ROAD 60148
LOMBARD ILL

# This is the gate

# RACO®

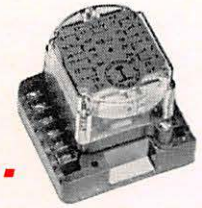
**MODEL GS TYPE III**
**HYDRAULIC GATE**




## Over 75,000 operations *without a failure!*

**(and still going strong in our continuous test program)**

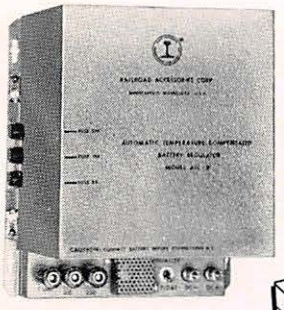
*this is the control...*



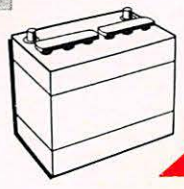
**RACO MR-10 RELAYS** are being used in the control circuits for the gate. RACO engineered for long life, reliable operation and convenience. Meets all significant specifications (AAR — Spec. 204-44) for Tractive Armature Direct Current Neutral Relay Plug-in Type.

U.S. Pat. No. 3,394,498
Canadian Pat. No. 805,420
French Pat. No. 1,565,894
and other Foreign Pats. Pending

*this is the power*



**RACO ATC-8** Automatic Temperature Compensated Battery Regulator is being used for the D.C. energy source. The RACO ATC-8 is working integrally with a 12 VOLT D.C. automobile type battery on heavy demands and restores the charge to the battery to assure full standby power at all times.



*...can you afford anything less?*

*Over 2,000 units are now in service on over 20 railroads.*

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## Railroad Accessories Corporation

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IN CANADA: Vale Enterprises, Ltd., 1120 Claire Crescent, Lachine, Quebec
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**Circle 1 on reader service card**

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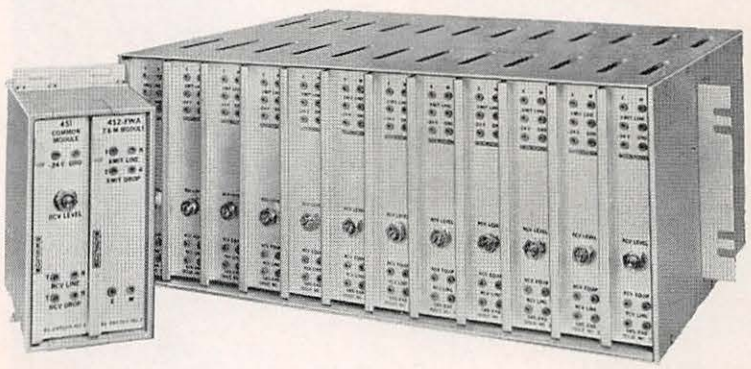
## *Compatibility with Flexibility...*

Through advanced design, these systems not only meet present day "E" type requirements, but also provide "F" type features for use in the years to come.

**WE DON'T STOP THERE . . .**

The 450 System with an individual built-in oscillator is ideally suited for customer premises or Central Office low-density applications. E&M, Foreign Exchange (FX), station or switching end, signaling modes of operation can be realized by simply changing a plug-in module. The 650 System satisfies medium to high-density requirements utilizing the common oscillator technique. The universal shelf will accept any of the plug-in signaling units such as E&M, FX or one-way dial. Pre-engineered, factory-wired and tested bays with or without a carrier group alarm, terminating sets, and jackfields can be provided to simplify field installation.



**WAIT, THERE'S MORE . . .**

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You know what can happen when moisture gets into railroad communications cable. Circuits fail. Schedules go out the window. Shipments are lost. You know the rest.

General Cable's new V/I (Vapor Impervious) communications cable construction is designed to avoid all that.

A thin metallic barrier acts as the moisture shield without significantly adding to the weight or diameter of the cable. The barrier is supported and protected by layers of special polyethylenes on both sides. The entire V/I component is formed about the cable core with the edge heat-and-pressure sealed along its entire length. It is available on both Qualpeth and Stalpeth types.

If you'd like to find out more about General Cable's V/I cable, contact us. It just might help you keep things running smoothly. Write to: General Cable Corporation, Section 600-25, 730 Third Avenue, New York, N.Y. 10017.

General Cable

*V/I is General Cable Corporation's trademark for its Vapor Impervious communications cable. U.S. Patent 3,206,541.

OCTOBER 1970 VOL. 1 NO. 7

# RSC RAILWAY SYSTEM CONTROLS

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Provides these advantages over other types of jacketing and insulation:

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Since the introduction of plastic insulated communication cable, more than 100,000 miles of Ansonia cables have provided exceptional reliability at installations throughout the U.S.

This performance record has been achieved because Ansonia:

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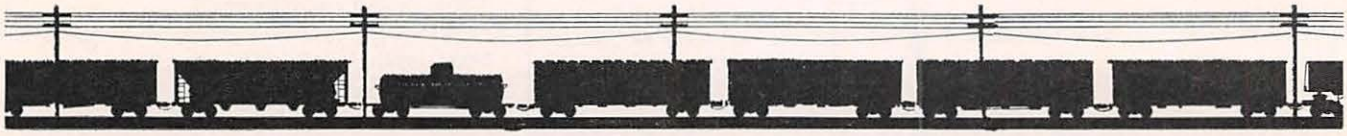

# onia

- Custom designs cable as needed
- Uses the most modern manufacturing equipment and methods
- Normally exceeds specifications
- Provides technical assistance and back-up service

## Specially Designed Railroad Cables

Custom design and construction of special cables has always been an important part of Ansonia's operation.

Working independently, or in cooperation with customers' engineers, our engineering department has been involved in a broad range of innovative developments. Included are unusual combinations of jacketing and shielding to meet a broad range of special conditions.

These conditions are represented by special purpose cables such as Hot Box Detector Cable, Shielded Communication Cable, Static Line Wire, Snow Removal Cable and many others.

No matter what your cable problem, our design engineers will be glad to help you solve it. In fact, this is just one part of our determination to be a prime source of cable for Railroads.

## Total Commitment to the Railroad and Fixed Ground Transit Industries

Beyond engineering design and construction, Ansonia provides these important extras:

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- Finest materials & workmanship
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- Complete coverage of your cable requirements
- Agents experienced in your industry

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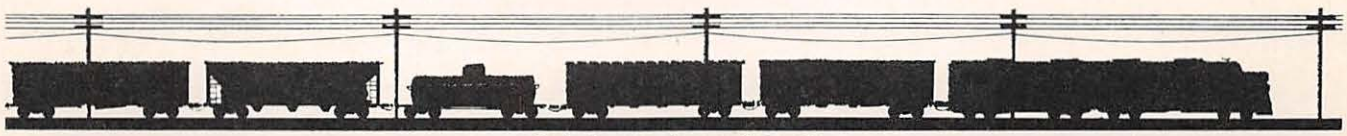
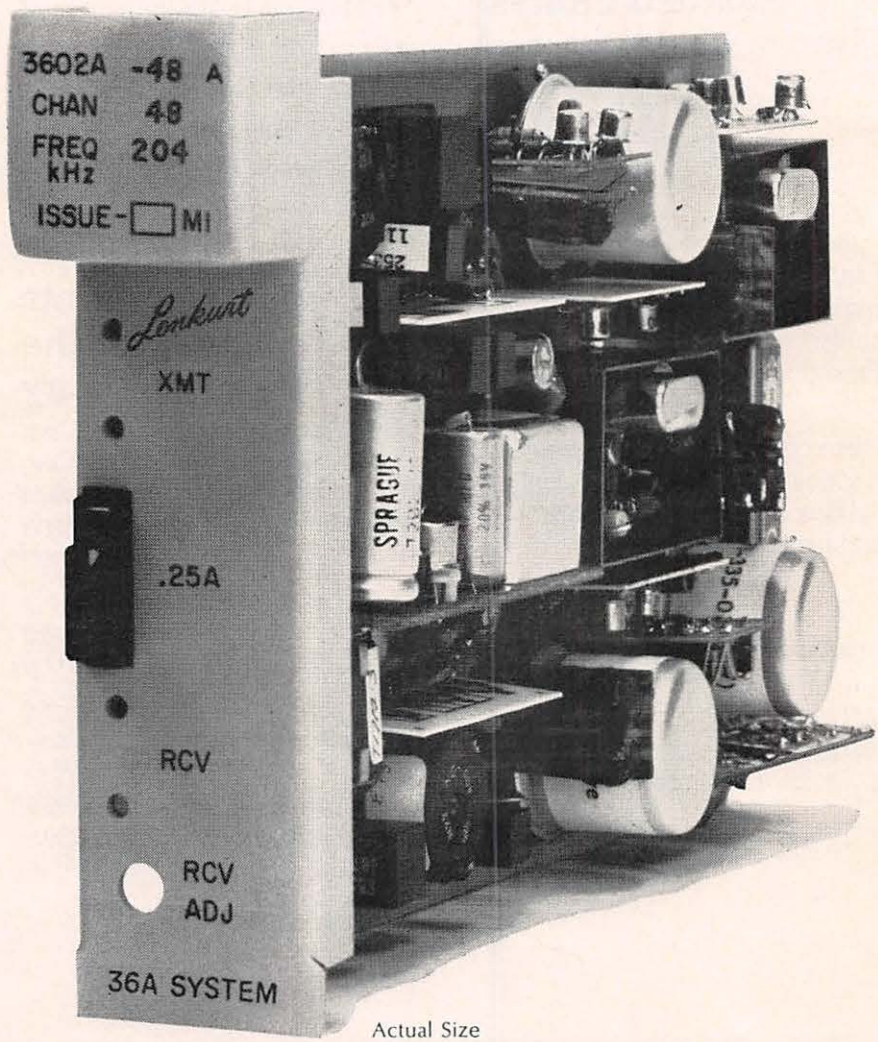


Circle 6 on reader service card

# Lenkurt reduces the size of 2 GHz " " " price " " "




Actual Size

# radio and low density multiplex.

Our new systems are by far the most compact, most economical you can buy.

The 36A, 48-channel multiplex is one-third the size of any comparable domestic unit. One duplex channel, complete with signaling, fits on a single card. And since each card is a self-contained, one channel system there is no need for expensive common equipment.

We get a duplex channel on a single card by using our 1-cubic inch, polylithic crystal filters. In addition, these filters make it practical to use the latest integrated circuitry to reduce size, price and maintenance problems. We've applied for patents on the manufacturing process of these filters, so nobody else is likely to have them for quite awhile.

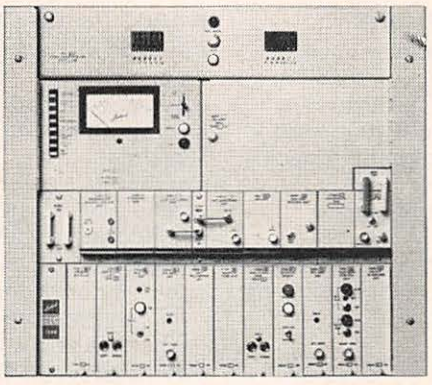
The 78F2 600-channel 2GHz radio is the smallest on the market, yet simple to service. The all solid-state transmitter and receiver are combined on a single shelf. And built-in test facilities will keep costs down by reducing all routine maintenance to a 5-minute job.

Compare the specs and prices on our systems with everybody else's, then give us a call: Atlanta (404) 261-8282 — Chicago (312) 263-1321 — Dallas (214) 363-0286 — Falls Church (703) 533-3344 — San Carlos (415) 591-8461.

Or write: Lenkurt Electric Co., Inc., Dept. C720, 1105 County Road, San Carlos, California 94070, for complete literature.

**Lenkurt 36A 48-channel Radio Multiplex** single channel stackable — 12 channels (three mounting spaces high) on a 19" rack — channels are identical except for small plug-in channel selection oscillators, so one channel (less oscillator) is all the "spare parts" you need — operates directly from 24 or 48 volts with 17-18 dBrncO noise — built-in E&M signaling.

**Lenkurt 78F2 600-channel 2 GHz Microwave Radio** 5 watt power output — operates directly from 24 or 48 volts — 8 dB receiver noise figure — 18 dBrncO/hop noise performance — a duplex system with baseband and power distribution equipment takes up only 10 mounting spaces on a 19" rack — push-button monitoring of power output, deviation, transmitter frequency and receive signal level — built-in alarms monitor power output, off frequency, receive signal level, transmit pilot and operation of hot standby switch.



78F2 Microwave System

**LENKURT ELECTRIC**
GENERAL TELEPHONE & ELECTRONICS

Circle 7 on reader service card

# tune in this great new radio show for the 70's

These are three of the superstar performers in the WABCO industrial radio lineup. The Portable 2.2, the 3R/3V/3D, and the 5W CARRYPHONE® radios offer the latest innovations in radio design. Modular plug-ins, solid state operation, interchangeability, easy serviceability, lightweight, rugged construction, and prices competitive or lower than comparable radios.

**WABCO ON THE AIR**

Put a rugged, reliable WABCO radio to work on your job for improved communications and long service life. For complete information on any of the three radios shown below or a free demonstration, contact your WABCO Sales Representative. Or write Westinghouse Air Brake Company, Signal & Communications Division, Pittsburgh, Pennsylvania 15218.

**WABCO 5W CARRYPHONE®**
- modular plug-in battery pack circuitry
- uses industrial D-Cell batteries (2 less than competitive models)
- rechargeable Nicad battery pack available
- option of either handset or microphone
- foolproof battery box
- swing out frame for easy servicing

**WABCO Portable 2.2**
- weighs 30 ounces, displaces 47½ cu. in.
- 14 plug-in modules
- compatible with all VHF-FM systems
- complete line of accessories
- most power per ounce of any hand-held portable on the market
- rugged construction—exceeds military environment tests specs for temperature, humidity, vibration and shock
- average repair time: 8 minutes
- priced $75 to $100 lower than competitive models

**WABCO 3R/3V/3D**
- 3R—locomotives, cabooses and base stations
- 3V—vehicle trunk mount
- 3D—vehicle dash mount
- smallest 35 watt radio on the market
- plug-in modules
- transmitter and receiver interchangeable with all WABCO models
- low standby drain
- accessories for any system
- proven reliability and performance in railroad market for 1½ years
- quiet line (tone squelch)

WABCO

An American-Standard Company

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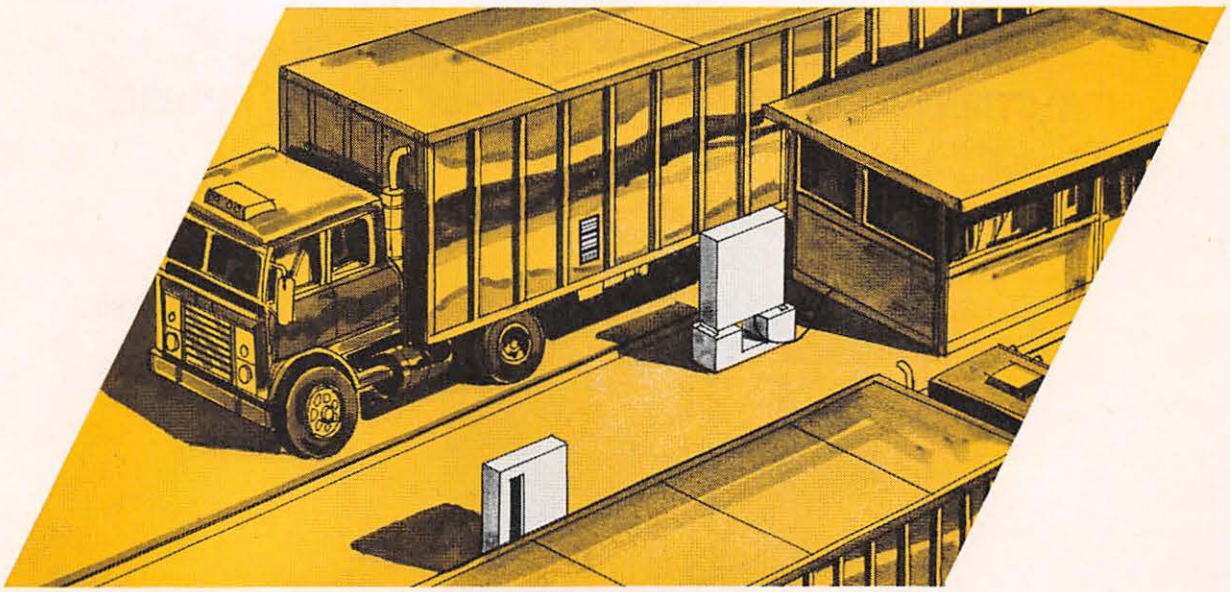
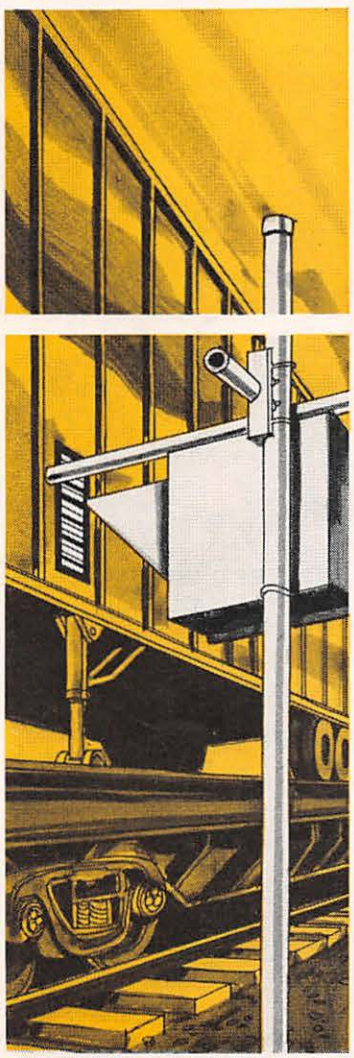
## for an efficient piggyback terminal





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**Take the Computer Identics Label!**
it stands for leadership in remote label reading and control systems for the transportation and distribution industries.

**Take the Intermodal Transportation Systems Label!**
it stands for leadership in the development of special equipment that can be used interchangeably for rail, highway and water transportation; and for full service leasing of equipment and entire terminal control systems, (INTER-CON).

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and you have your 2+INTER-CON — Intermodal Terminal Control system — installed with no capital outlay, generating vital, real-time information that translates into better control, faster service and higher profits from the very first day.

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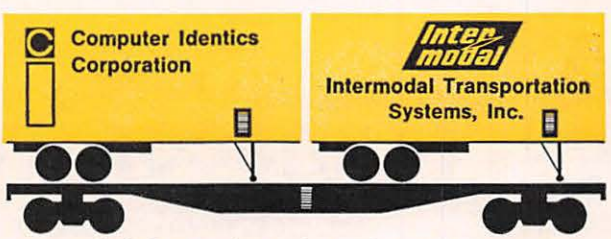
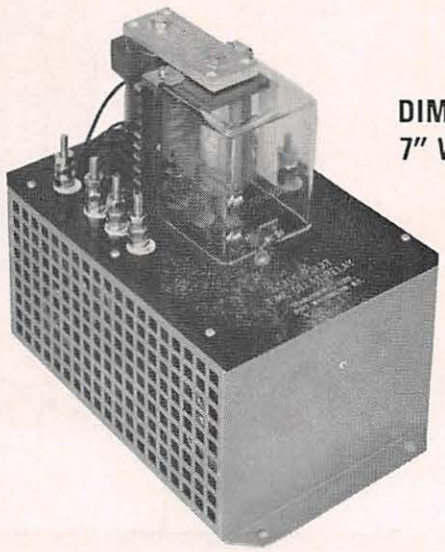



Circle 9 on reader service card

# TRANSCO

## PD1XT TIME DELAY RELAY

### FOR PREVENTING LOCKOUT OF HIGHWAY CROSSING DIRECTIONAL STICK RELAY DUE TO TRACK CIRCUIT FAILURE.



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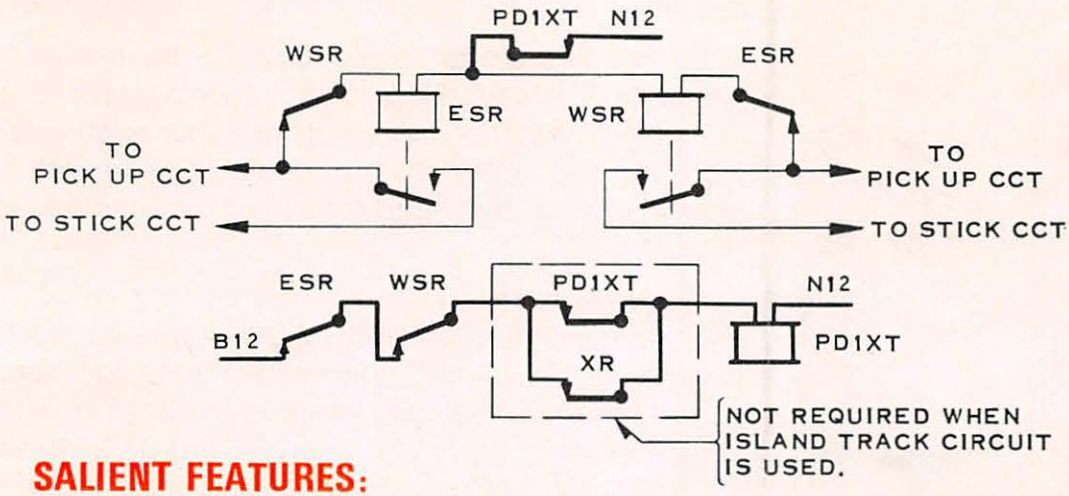


**SALIENT FEATURES:**

1. AVAILABLE IN 4 MIN., 8 MIN. AND 12 MIN. RELEASE TIME.
2. TIME–OUT IS BASED ON FAIL SAFE, CLOSED CIRCUIT PRINCIPLE.
3. AVAILABLE IN PLUG-IN ARRANGEMENT.

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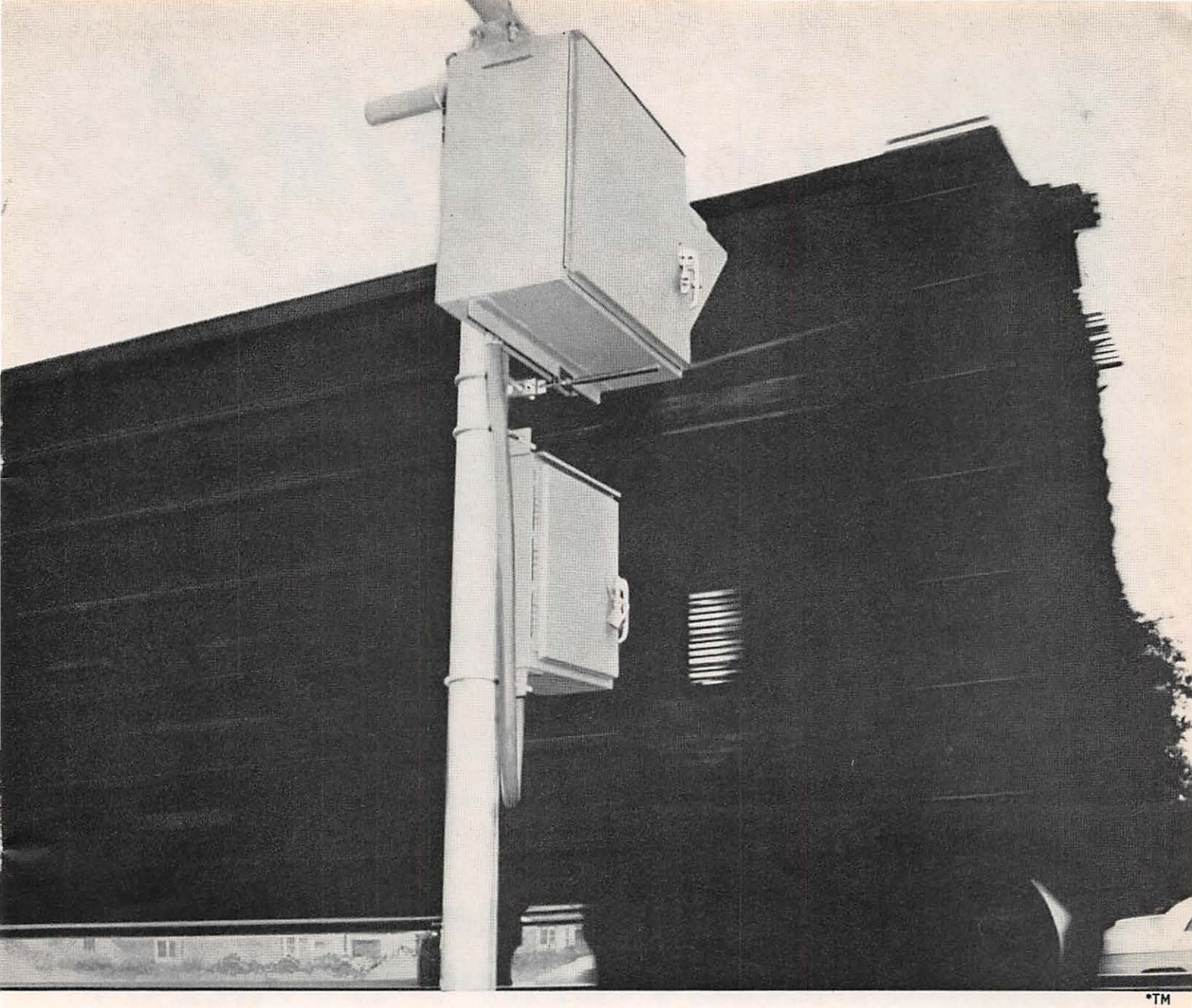
Circle 10 on reader service card



*TM

# 99.99% ACCURATE.

## Even we weren't sure KarTrak was that good until a major railroad tested it.

Out of 42,197 label readings in a full-scale test of our KarTrak* ACI system, there were only two undetected errors.

(That's two cars out of about 400 miles of freight cars.)

Which means "Output Accuracy" was 99.99%.

Our Scanner/Decoder system hung up some other nice statistical records.

"Detection of Cars" turned out to be 99.93%.

"Completeness of Message" tested out to 99.72%.

The system detected 100% of all trains on the track.

And it proved to be 100% available —no breakdowns during the entire course of the tests which ran 24 hours a day for a 6-week period.

All these results clearly show one thing:

As long as the labels are readable, KarTrak will detect and report virtually 100% of all cars.

Nobody's perfect.

*We'll be glad to tell you more about KarTrak and these tests. Write to: Sylvania Information Systems, Commercial Electronics Division, Waltham, Mass. 02154.*

SYLVANIA
GENERAL TELEPHONE & ELECTRONICS

**Circle 11 on reader service card**

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## ...the brand new, red hot

# FREQUENCY-SHIFT OVERLAY TRACK CIRCUIT

It's an entirely new concept in overlay track circuits, and it really gets results. New, super-selective tuned circuits and new receiver techniques (patent pending) pull a strong, clean signal out of noise and interference conditions once thought impossible. Where conditions are worse than bad, you can beef up the transmitter with an optional power amplifier — and slam the signal through with a hefty four watts. Power line interference is no longer a problem. All fifteen frequency channels are selected to be clear of harmonics of any currently-used power frequencies, and are mutually compatible with one another. Frequency determining elements plug in. A transmitter or receiver can be changed from one channel to another in minutes.

Centralized equipment installations are easy with FSO. The transmitter can be 3000 feet from the track connection, and the receiver can be 6000 feet from the track connection. At low frequencies, track circuits can be as long as 6000 feet. Want to know more? Ask for Publication PD-36.

**GENERAL RAILWAY SIGNAL COMPANY**

A UNIT OF GENERAL SIGNAL CORPORATION

ROCHESTER NEW YORK 14602

ATLANTA BOSTON CHICAGO MONTREAL NEW YORK OAKLAND ST LOUIS ST PAUL

3515

**Circle 12 on reader service card**

# L&N trains communications men

Pole lines are basic to most every railroad's communications plant, and Louisville & Nashville is no exception. Its pole lines carry telephone, teleprinter, message, dispatcher and data circuits as well as signal circuits, such as for centralized traffic control and automatic block signaling.

Although there is more to communications than the pole lines, most new men joining L&N's communications department start with crews maintaining pole lines. Hence, L&N started a school for its new men last February.

To provide training in pole line work, LN constructed a miniature pole line —with short and tall poles—near its Louisville, Ky., headquarters (see cover photo). Students using safety belts and lineman's climbers first worked on the short poles, near the ground. Later, after they had more training and were sufficiently proficient in their work, they "graduated" to full length poles.

In addition to safety and climbing, the students were taught how to attach line wires to insulators, repair lines, mount crossarms and insulators, guy wires, and to spin cable with special equipment. Also, they were taught how to ride the "cable buggy" to inspect cables from mid-span positions away from the line poles.

E. W. Turner, general foreman-outside plant, aided by D. W. Hodgens, assistant circuit designer, handled the outside pole line construction and maintenance classes. As part of the pole line training period, lasting about one month, the new men played catch with a basketball while strapped to poles some 15-20 ft above the ground. This type of practice session gave the men confidence in working at such heights and added to their dexterity to work with both hands free.

L&N's communications department school began with classes in Louisville's Union Station. M. R. Williams, superintendent communications, initiated the school by outlining L&N's policies, history and current operating procedures.

**AUGUR REMOVES DIRT** from pole hole as trainees learn on L&N.

**CLASS INSTRUCTION** covered basics and practical equipment study.

Turner reviewed signals, time tables, train orders and transportation department rules, and the importance of safety. Safe working practices were stressed including that of safe driving habits, because most communications crews use motor vehicles.

Films, charts, circuit diagrams, books, pamphlets and some equipment were available as classroom teaching aids. During these morning sessions, students were introduced to such subjects such as basics of electricity, circuitry and circuit identification, telephony, troubleshooting, basics of electronics as well as mathematics needed in their work. Fred Wix, assistant engineer communications was aided by Hodgens in conducting these classes.

Outside instruction, often conducted in the afternoons included pole line climbing and work including line construction, such as setting poles. Although they were instructed in the manual method of digging pole holes and setting poles, each man was trained to operate L&N's hydraulic pole line construction trucks. The men were shown how to dig with the augur, retract it for pulling dirt out of the ground, and how to set poles in the newly dug holes using the boom. D. M. Aines, supervisor communications, conducted this phase of the training program.

At the end of the month's training period, each student was carefully tested. After passing oral, written and on-the-job examinations, the men joined the communications department as full-fledged employees.

Present and future manpower needs were taken into account by L&N's personnel and employment department in helping set up the school. Men in the first class were brought in from points on the system where vacancies in several communications crews existed. Considered a success, L&N's communications department is planning to hold more such schools in the future.

To keep its men up-to-date on communications and electronics developments, L&N's communications department has its own lending library in its Louisville headquarters. Men can borrow materials, or the communications department may send material out to its field forces including such items, as books, technical manuals, and technical magazines. Classes, including those held by manufacturers, are held periodically on many divisions to acquaint men with new equipment or new and improved methods of maintaining existing communications equipment.

L&N's communications department encourages its men to enroll in International Correspondence School courses dealing with electronics and other related subjects. Costs for these courses may be paid for through a payroll deduction plan.

All communications field forces receive first-aid training with review courses provided periodically.

L&N is one among several railroads that are providing training for its communications men. Milwaukee, Reading and Santa Fe are working in this area providing up-to-date training to better equip their communications maintenance forces for handling improved technology.

Santa Fe has kept its men up to date by making financial aid available for job-oriented correspondence courses they have taken from electronic trade schools. Many of these courses are oriented toward transistor fundamentals including operations and maintenance techniques to deal with new equipment using semiconductor devices. Also, the railroad has sponsored courses for men within a particular class of work performed.

Also, maintenance men have been sent to manufacturers' schools to obtain knowledge about new equipment operation and maintenance techniques associated with such equipment. "To maintain transistorized equipment, men must have a specialized knowledge, and this means an ever increasing need for training of personnel," says H. L. Massie, assistant superintendent of communications, system.

On the signal side of railroading, many railroads have training programs in operation. Santa Fe, along with Canadian National, Rock Island, Western Pacific, Texas & Pacific, Reading, Milwaukee, and Elgin, Joliet & Eastern are just a few that are providing signal training programs for their men.

CN's signal training program is system-wide with a classroom in each of five regions: Moncton, N.B., Montreal, Que., Toronto, Ont., Winnipeg, Man., and Edmonton, Alta. Equipment at a typical classroom includes a completely wired and operative flashing-light signal, semaphore and colorlight signals, switch machine, electric lock and several types of track circuits. Each region has one signal instructor with two each at Montreal and Toronto.

About 300-400 signalmen are in training. The basic course, Section 1 is required of all new signal employees. Section 1 covers two years and includes classroom instruction with lectures, small group discussions, practical demonstrations and films. Home study by correspondence is carried out between classroom instruction periods. Four courses of 10 days duration are given every 6 months. Students are sent to the classroom of their region.

# PC ups its service at Buckeye yard

**DAILY CLASSIFICATIONS** total 2500-3,000 cars over Buckeye hump.

Performance at Penn Central's automatic yard in Columbus, Ohio is steadily improving. For example, cars now average only 18 hours (arrival to departure) in Buckeye yard, not 25 as erroneously reported in last month's issue of Railway System Controls.

Other improvements in operating procedures are continuously being made to upgrade service to customers. For example, Buckeye (as the Columbus yard is named) now does blocking of eastbound traffic from the St. Louis gateway so that Big Four yard in Indianapolis can concentrate on westbound work.

Buckeye receives blocks from Missouri Pacific, St. Louis Southwestern and Alton & Southern. Buckeye then blocks cars directly for Selkirk yard (near Albany, N.Y.), and Enola yard (near Harrisburg, Pa.) as well as for a dozen intermediate cities.

PC also has a blocking and power pooling arrangement with Southern Railway. PC makes up blocks for Chattanooga, Tenn., and Atlanta, Ga. for train "OAC-7" which is turned over to Southern intact at Cincinnati. The power pool consists of composite sets made up with one PC diesel unit and three Southern units (including Central of Georgia).

Arriving and departing trains total about 15-20 daily, but Columbus terminal originates more loaded traffic than it receives. This keeps car distributors busy looking for empties, and makes terminal control so vitally important. Centralization of paper work and car classification at Buckeye has reduced the congestion and delays at Columbus, and improved car supply for local industries because of the improved efficiency of the new yard.

One of the means used to increase efficiency has been centralized control of five interlockings through which trains enter and leave Buckeye yard. Thus trains can arrive and leave the yard area promptly because they operate by signal indication and crews do not have to stop to operate switches. Controls and indications from the field interlockings are handled over a GRS 4,000 code system operating at 200 bits per second to a new control machine, manufactured by Puleo Electronics. The track diagram panel of the control machine uses fibre optics to provide light indications. Light from one bulb can be distributed by fibre reeds or light tubes to several panel "dots" or locations. Use of fibre optics reduces the number of indication lamps required to provide signal, track occupancy and switch position indications on a control machine track diagram panel.

Buckeye yard is a 40-class track automatic yard operated by twin General Electric process control computers. The GE/PAC 4020 computers have the capacity to handle classifying operations and the data processing so vital to the yard. The two computers are linked by a 12-bit, full duplex high-speed circuit. Both are kept informed as to operations, although one is the normal unit and the other is the standby unit.

A maintenance test panel is connected to the computers and can be switched from one to the other. Electronic technicians can monitor complete humping and yard operations from the test panel.

Prime contractor for the yard control system was General Railway Signal Co., who also furnished retarders, switch machines, signals and the twin process control computers.

Automatic switch alignment at the north end of the yard provides for improved operations as regards arriving trains. Trains arriving from the north have their switches automatically aligned for the proper yard receiving track when they occupy the yard track indicator circuit.

Direct reporting by car inspectors to the computer saves time in the car inspection process and keeps yardmasters informed more promptly as to train readiness for classifying or departure. When car inspections are complete, receiving or departure yard car inspectors push buttons located in telephone booths near the inspection locations. The computer provides a report to the appropriate yardmaster that inspections are complete.

# Efficient transportation needs

"You are not in the communications or signal business for its own sake, but you are in it to play a key part in the efficient production of good transportation. Let me urge that each one of you direct your efforts to that single vital objective at all times.

"Imaginative system planning incorporating computer communications and signaling are vitally needed on a broader scale to produce the kind of railroads that will best serve the marketplace. We must achieve the utmost in reliability, safety and speed in rail transportation, while holding costs down so that rates can remain attractive, if we are to improve our economic position. You should know as much as humanly possible about your particular profession, be it signals or communications, keeping in mind that we have only one purpose: to offer our customers good, timely and efficient service. This is our real objective," said keynote speaker, R. D. Spence, vice president-system operations, Southern Pacific Transportation Co. at the tenth annual meeting of the Communication & Signal Section, AAR, in San Francisco.

"We expect that what you have recommended and what has been installed not only will work but will be the most economical method for the purpose being served. The traditional type of railroad communications and signal departments are not income earners in the sense that we can look at a balance sheet and see their earnings over several years. Rather, your efforts and ingenuity are reflected in the decreased labor costs, greater efficiency and safety in the field, and—more important—in satisfied railroad customers.

"The communications and signal engineer should be able to look at his individual road's future, see where it is going and from its revenue and growth predictions be able to determine considerably in advance where the railroad should expand its communications and signal facilities. Needless to say, your foresight in this respect will enable your company to purchase its needs at a much lower price and will allow for more thorough system planning," Spence said.

"Occasionally, one of the government agencies will render decisions that affect your particular domains and you should be on the alert to determine how this decision could affect your railroad and perhaps help improve its earning ratio. For example, the Federal Communications Commission recently handed down a far-reaching decision, which, it is hoped, will eventually permit specialized common carriers to offer communications services in competition with Bell's services.

"Southern Pacific, therefore, organized a new subsidiary, the Southern Pacific Communications Company, which has applications pending before the FCC for permission to offer commercial service between Seattle and San Diego along the Pacific Coast and between Los Angeles and St. Louis transcontinentally. While this move does permit further diversification for Southern Pacific, if approved it could do much to reduce communications costs for not only ourselves, but possibly for other members of the railroad industry as well as the customer the railroads serve," said Spence.

"Management must insist that its communications and signal planners look carefully to the future in system concepts, for without advance planning the systems you propose today can well become the burden of tomorrow or the more distant future.

"This mention of the future affords me the opportunity to remind you of your duty and obligation to attract new people in your field to the railroad industry and then to see to their subsequent training.

"The future of the railroads is dependent upon dedicated people such as yourselves who have not only the necessary technical knowledge but also the ability to relate this knowledge to the requirements of a changing society," Spence concluded.

"Approximately one-third of all accidents that occur at highway crossings occur at crossings protected by flashing light signals. One can assume that some of these drivers did not see the signal, and therefore, a more conspicuous signal would be a safer signal. Human engineers have taught us that one way to make a signal more conspicuous is to make it brighter.

"An analytical method can be used to optimize the design of a specific signal beam. This beam has an intensity distribution such that the approaching driver sees a minimum beam intensity of 400 candelas all the way from 1000 ft from the signal to within 50 ft from the signal" said Victor L. Lindberg, scientific research staff, Ford Motor Co.

A signal beam has been designed to be used on a relatively straight and level crossing and mast-mounted on the right side of the road. "As can be seen from Figure 1, the possible driver eye positions for most cars and trucks are contained in a triangular space which broadens to the right of the vertical axis. Figure 2 is a photograph of the view from the signal position of a road approaching a crossing. The camera was placed between the signals and aimed away from the crossing when the picture was taken. Three driver

## MANAGEMENT INFORMATION

New technologies to aid in the development of more efficient transportation were explored at the tenth annual meeting of the Communication & Signal Section, AAR, in San Francisco last month.

Although emphasis was on new means of getting more for the communications and signal dollar, reviews of existing practices were discussed. For example, are present train-stopping criteria correct for trains passing hotbox detectors? Norfolk & Western has tightened its criteria for stopping trains so that mechanical department forces will more closely check on bearing performance. (Details to be published in next month's issue.)

Remote control of slave locomotives used in helper service is working well on several railroads. Panelists at the C&S meeting brought out that use of radio repeater stations often extends and provides more complete radio coverage to insure continued operation in hilly country and in heavy curve territory.

# C&S efforts

eyelines are drawn which correspond to 45", 70" and 95" eye height and include approach distances of 2,000 ft to 50 ft. If the desired beam was one which was to include all driver eye positions up to 50 ft and have a certain minimum intensity for all these positions, then the isocandela line for this minimum intensity would have the approximately triangular outline on the photograph.

"Using this isocandela outline as the basis for the design of a lens, a prototype lens was made which produces a beam with approximately this light distribution. A basis for the design was that the intensity be at least 400 candelas at all points within the outline. Another condition for design was that the signal using this lens be aimed at the common aim point, that is 400 ft, and at the center of the approach lane.

"Figure 3 shows the isocandela beam pattern using this prototype lens with a standard 18 watt bulb and a silvered glass parabolic reflector. The lens or roundel has been called a multiple beam roundel, since the beam is composed of three separate beams directed in specific directions. One portion of the beam which comprises 40% of the total light, is deviated 7½ degrees to the right and then spread into a 15 degree wide beam. The shape of the other two portions of the beam are similar to the first. Their positions, however, are rotated about the signal axis (the aimed direction of the signal) by 11 degrees and 22 degrees, respectively. The lower beam (22 degrees rotation) contains another 40% of the total light and the intermediate beam contains 20% of the total.

"It must be emphasized that this lens can only be used on the right side of the road. It would be ineffective when used on a cantilever overhead mount or as a backlight on the left side of the road. The same method for a design, however, can be used to design an optimum signal for either of these two positions" Lindberg said.

One method of aiming uses a radio tone to tell the adjuster when the signal is properly aimed. This device, when placed at the desired aim point, senses the intensity of the light beam and transmits this information to the adjuster by radio.

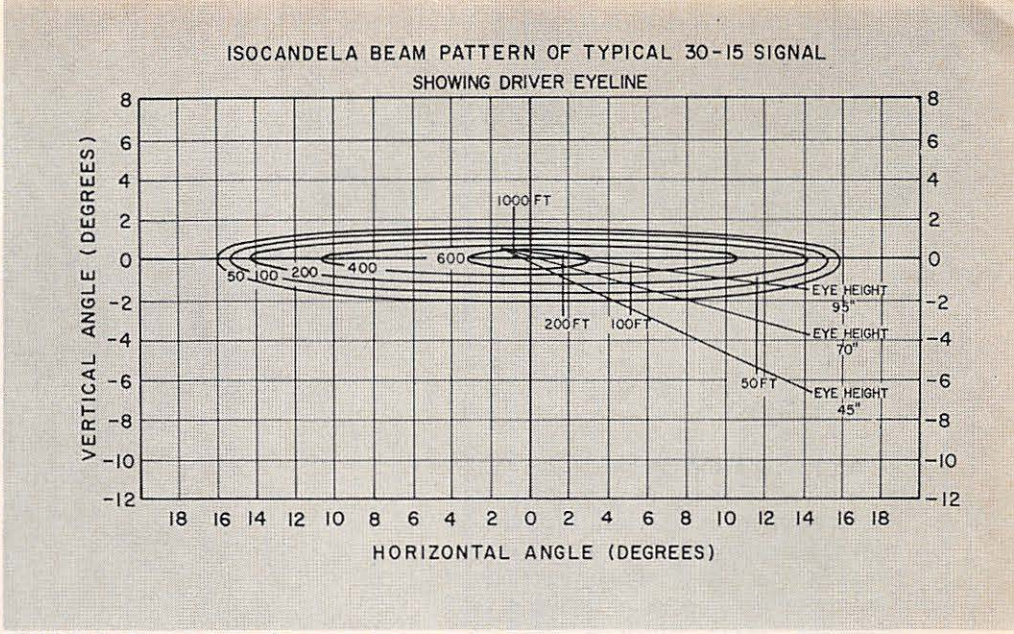



**FIGURE 1**—Signal beam is at straight and level crossing.

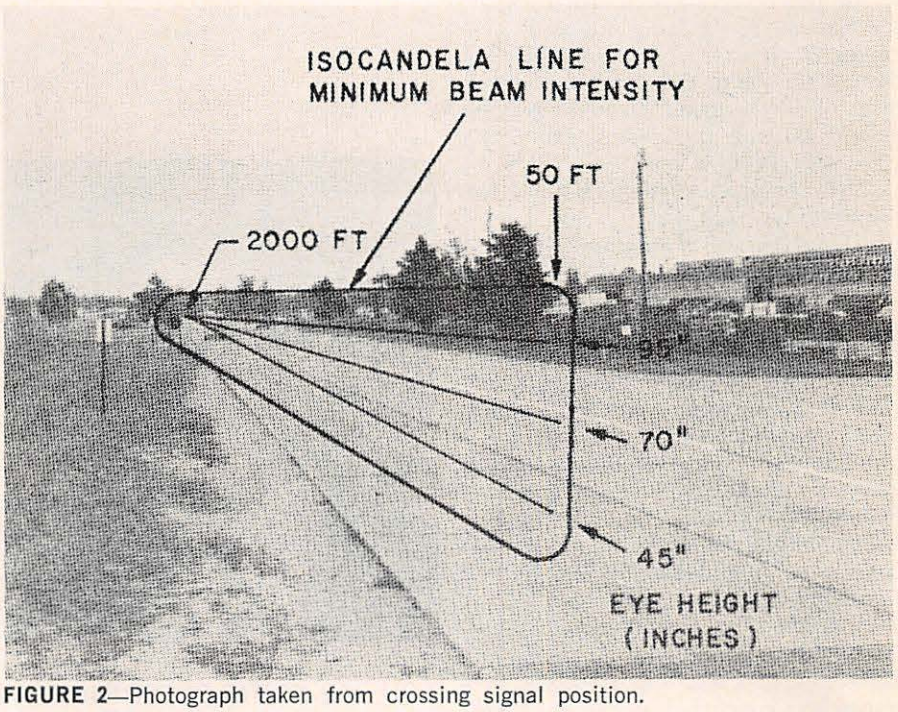
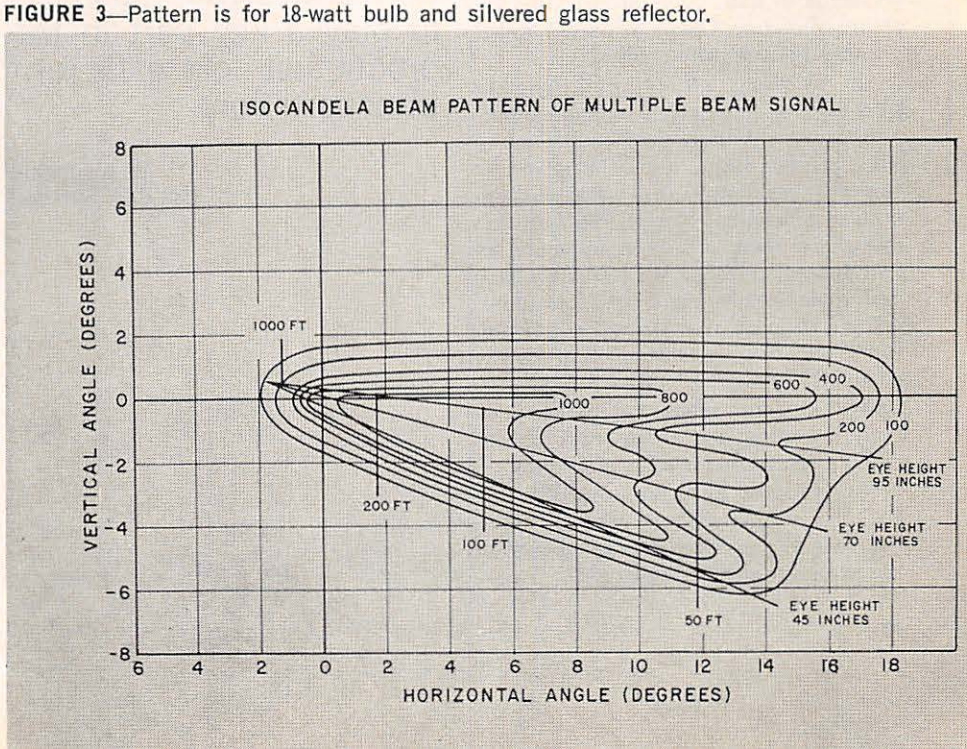



**FIGURE 2**—Photograph taken from crossing signal position.

**FIGURE 3**—Pattern is for 18-watt bulb and silvered glass reflector.



"Another aiming method makes use of the optical imaging properties of the parabolic reflector which is used in most crossing signals. This device is a ten power microscope which plugs into the lamp socket in place of the lamp. A cross line reticle, which is observed through the microscope, is positioned at the precise location in space which the filament of the lamp ordinarily occupies. With a target positioned at the desired aim point, the signal is in alignment when the image of the target, as viewed through the microscope, coincides with the cross line reticle.

"Both of the above methods have the distinct advantage that the man doing the adjusting also determines the correct alignment" Lindberg said.

Federal Railroad Administration is active in the communications and signal area. For example, an FRA-funded report "released earlier this year, dealt with highway-railway grade crossing safety and recommended safety improvements to some 30,000 crossings across the country. There are approximately 225,000 grade crossings in the United States. Of these, about 45,000 have some special kind of protection. Accidents at crossings result in 1500 to 1800 deaths, 3500 to 4000 injuries each year, and economic losses in excess of $300 million. These improvements, the researchers concluded, would cut these accidents in half," said M. B. Mitchell, acting director, Office of High Speed Ground Transporation, FRA.

"In my view, nothing in all the complex field of railroading is more important than communications and signaling since it goes right to the heart of the two very basic problems—safety and operating efficiency. And while here, as elsewhere, there is a need for more research and testing. We already have had some involvement with communications through the Metroliners. From the FCC, we borrowed 6 two-way channels. Working with AT&T, we have excellent telephone service on both incoming and outgoing calls, including the problem areas of tunnels.

"We propose to do some work in the Radio Communications Field—studies that would look into the adequacy of the present hardware utilized.

You are in the communication and signal business to play a key part in the production of efficient transportation.

**W. M. Jaekle**
**(for R.D. Spence)**

"We also have been doing some work on obstacle detection for the past two years. RCA has completed preliminary development of a wayside optical laser beam scanner system, which, in our field testing, has proven the feasibility of detecting objects one to two inches in size. Right now, we're studying three alternatives: First, laser scanning, that is scanning and fixed-beam lasers; Secondly, fixed nonlasing diodes; and thirdly, electrostatic systems. The fixed nonlasing diodes appear to look most promising of the three. The objectives of this program are to increase reliability and at the same time reduce the possibility of false alarms and to find a system which has a low cost per mile", Mitchell said.

"In the field of train control, we want to apply some advanced aerospace concepts. To this end, we plan a 100-mile test track to be selected from an existing roadbed on which we will install these systems and test them.

"We also are actively seeking to develop low cost advance warning systems for protection at highway-railway grade crossings. There is a critical need for reducing the present cost of from $10,000 to $40,000 per crossing for this protection. We want to develop more sophisticated sensing systems, especially to control highway traffic flow based on train speeds. Several such systems are currently under review and we want to take the more promising into actual demonstrations," Mitchell said.

OHSGT will also do research and testing at FRA's high speed ground test center in Pueblo, Colo. "The crowded radio frequency spectrum has led us into investigations of leaky wave guide systems and various surface wave transmission line approaches. At the test center, we plan to investigate these areas on a special four-mile section of track, especially how they react under varying speed and weather conditions" said Mitchell.

"Integrated circuit technology will have an even greater impact on the products of the 70's than transistorization had on the products of the 60's" said Theodore Saltzberg, manager common carrier mobile products, Motorola-

## *have a greater impact in the 70's than did transistors in the 60's*

Communications & Electronics Inc.

"While cost and reliability are important benefits to the two-way radio user, we will find that integrated circuit technology does considerably more for us. It now permits us to implement new and more effective circuit and system configurations which were never before possible. Integrated circuits also permit us to design equipment that is more serviceable even though the equipment has increased in sophistication and performance. The serviceman of tomorrow will need to know only what the equipment does . . . not why it does it.

"An integrated circuit is an integral solid state configuration, produced as a single entity, which performs as a complete functional circuit.

"The conventional squelch and audio output circuits found in a two-way radio normally consists of 34 components. Now integrated circuit technology permits us to consolidate these circuits into only two basic integrated circuit packages" said Saltzberg.

"Servicing of the unit, should it be required, is performed at the functional level, rather than at the circuit component level. The serviceman does not need to know the purpose of each resistor, capacitor, diode and transistor in the circuit.

"In the case of the squelch circuit just described, it was possible to economically add a dual mode squelch action which virtually eliminates the annoying noise burst or squelch tail, normally heard at the end of each two-way voice transmission. The reduced circuit board area that is now occupied by these circuits permits additional functional circuits to be easily accommodated which were formally excluded for economic reasons" Saltzberg said.

"Another important aspect of general IC technology permits the implementation of higher performing components such as the all-important RF power transistor. A typical high power RF transistor may, in fact, consist of 100 separate transistors all incorporated in the same chip. Included on the chip with transistors are balancing resistors built right into the device. This assures that each basic transistor is coupled to the other transistors to provide a properly distributed network of transistors. This provides readiness and reliability in the mobile environment of voltage and temperature extremes.

"Integrated circuit technology permits us to provide more sophisticated implementations of functional networks in smaller size with greater reliability. This technology permits us to do things which were not feasible because of physical and economic restraints.

"As we enter this era of integrated circuit technology, we can be assured that we will continue to see new and improved vehicular communications performance. We will also see an increase in the number of functional circuits, making the equipment more serviceable, and assuring that the equipment provides continued service" Saltzberg said.

Nothing is more important than communications and signaling since it goes to the heart of safety and operations.

**M. B. Mitchell**

Factors to be considered in choosing relay or solid-state circuits for CTC were discussed by H. C. Sibley, research engineer, General Railway Signal Co.

"Relay systems using highly reliable signal-type relays are limited to a code rate of approximately 10 bits per second. Solid-state circuits, of course, have no speed limits of significance to CTC systems. Where no more than 10,000 code cycles (controls and indications) per day are required, relay systems may be fast enough.

"In a typical CTC installation, the ratio of control messages to indication messages is about one to eight. The hybrid system using relays for controls and solid state for indications makes good use of this ratio.

"Slow-speed systems, either relay or solid-state, may be operated over a DC line or a leased telegraph channel. When the CTC apparatus is connected to the line through low-pass filters, voice and carrier services may be placed on the same line pair with the CTC. If the CTC system is operated either over leased voice-grade channels or by carrier on the railroads own line, modems are required. A voice-grade channel without special conditioning can usually handle CTC systems using simple frequency shift keying up to 1200 bits per second.

## *Current needs are for diagnostic maintenance programs and portable*

"Low speed systems are quite tolerant of impulse noise. If the duration of the noise burst is short compared to a bit time, the noise may be removed by filtering. Relay code systems inherently filter out these noise bursts by the slow response and relative insensitivity of relays. When the system speed is increased to the point where the duration of a noise burst becomes a significant portion of a bit time, message bits are changed and errors are introduced. When the noise bursts are shorter than a bit time, errors may be limited to single bits per noise burst.

"Relay code systems are often operated successfully with no precautions taken against errors due to line noise because of the insensitivity of relays to all but direct energization. Solid-state systems always contain some form of code security because their higher bit rates and sensitive circuits make them vulnerable to expected line disturbances. The purpose of code security is to detect when an error has occured in a message and to prevent delivery of such a bad message.

"The type of security must be carefully chosen to fit the requirements. Too little security can lead to wrong information which will not be tragic because of local safety circuits, but can lead to traffic delays if timing circuits are tripped. Too much security increases message time and offsets some of the advantages of a fast bit rate. Security increases complexity and therefore reduces reliability" Sibley said.

Relay equipment can readily be built with insulation levels high enough so that it can be protected by signal-type lightning arresters. Also, it is not damaged or operated falsely by transients generated by the operation of other relays at the location.

"Solid-state equipment can tolerate much lower voltages. Typical transistors have maximum ratings of 60 to 100 volts, while integrated circuits may be damaged by anything over 10 volts. Protection against lightning surges must be handled in several stages, the signal arresters being supplemented by additional devices such as gas arresters and zener diodes.

"The damaging effects of transients caused by relay operation are eliminated by suppression applied to the coils of relays controlled directly by solid-state drivers. Often these directly controlled relays are of the reed contact type and are used as interfaces between the solid-state equipment and the signal relays.

"The sensitive devices used in solid-state systems do not need direct metallic connection to such noise makers as relays to operate falsely. Enough energy is readily coupled through inductive and capacitive coupling to affect not only input and output circuits but circuits that are wholly confined within the system. The only sure way to prevent false operation of these circuits is to suppress the noise at the source. Diodes, R-C networks, varistors and, sometimes, simple resistors are placed across the coils of all relays in the housing where the solid-state equipment is located.

"Since solid-state systems cannot be designed to correct for false operation due to noise affecting their innermost circuits, the consequences of such false operation must be considered and adequate noise suppression must be provided in the planning stage of the project" Sibley said.

"If the signal department has had no previous experience with electronic equipment, some consideration should be given to maintenance. Relay systems have the advantage of slow operation and, of course, the movements of the relays can be watched. Also, modern relay systems use one type of relay throughout so that the spare parts inventory is very small.

"Solid-state systems generally require more test equipment and higher skills than relay systems. The circuits are generally more complex than relay circuits because of the need for security and noise rejection.

"However, solid-state systems have some built-in maintenance aids. Indicator lamps and test points help to isolate trouble to a single module, and all modules are plug-coupled. There are generally several types of modules in any system and spares of each of these types must be stocked.

"Where the same maintenance force

You should address yourselves to interchanging communications facilities.

**J. N. Albertson**

## test units for radio remote control locomotive equipment

takes care of both signal and communications equipment, relay systems may show less advantage in maintenance costs" said Sibley.

"Relay systems are often less expensive than solid-state systems; DC line circuits are less expensive than carrier equipment. When the cost of noise suppression for all relays is added to the other costs of solid-state systems, the relay system generally shows large savings.

"However, these savings come at the cost of flexibility. Future expansion of the system, especially if it involves consolidation of large interlockings, may require replacement of the entire system.

"Where high bit rates are necessary, the decision is easy—solid-state is the only answer. Where a slow speed system can do the job, the decision must be made on the basis of total cost and future requirements. A job which can use a slow system today may be enlarged in the future. Relay systems can usually be enlarged somewhat at the cost of more time per message. Solid-state systems, with their modular construction, can be expanded easily. Also, since they have no limit on bit rate, system speed can be increased to keep the message time short as the capacity is increased.

"Since all locations along the railroad may not be accessible to common carrier service, a relay system operating on a private wire pair may be used to feed larger centers where a high speed solid-state system relays the information to the control office" Sibley concluded.

Radio control of helper locomotives requires very close coordination between C&S men and mechanical department forces. The relay interface cabinet which connects the radio equipment with the locomotive control units is considered to be the division point between communications department and mechanical department responsibilities. Santa Fe has 26 RCE-1 (remote control equipment) systems. The remote control equipment for the road-train slave locomotive is carried in a relay car. Although these cars do not have air brake or motive power equipment, their use permits flexibility to use non-RCE equipped locomotives for slave operation. Santa Fe is using slave locomotive operation on unit coal and potash trains. They have been able to operate successfully without wayside radio repeater stations. The RCE car, with radio and control equipment, is coupled to the slave locomotives and located about 60% back in the train.

Current needs are for diagnostic communications maintenance programs, more accurate and complete information about failures, and portable RCE test equipment, said H. L. Massie, assistant superintendent communications —system, AT&SF. At present, Massie said, a second RCE relay car and lead locomotive with Locotrol equipment are required to test a system. Accordingly, portable test equipment would enable testing without tying up two complete systems.

Southern is operating 30 trains daily with the RCE slave locomotives with 57 lead locomotives and 39 relay cars equipped with radio and Locotrol equipment. Wayside radio repeater stations are used to provide coverage in cuts, hilly terrain and through tunnels, said M. W. Hewett, communications engineer, Southern. For some tunnel applications the radio station is located outside at one end with an RG-8U antenna strung inside along the tunnel wall at locomotive height. At one tunnel, a second antenna connected to the radio station is located atop the hill. With a 30-watt base station, 24-watts RF power is delivered to the tunnel antenna and 6 watts to the hill-top antenna. This provides radio coverage outside, in approach to and through the tunnel.

This year Rock Island is making its third installation of Pulse Modulated Control in automatic block signal territory on 44 miles of line. PMC developed by Marquardt Industrial Products Co. eliminates line wire for signal control circuits and insulated joints. "Any insulated joint eliminated also eliminates a future signal interruption especially with the maintenance these joints are receiving" said W. B. Johnson, signal engineer, CRI&P.

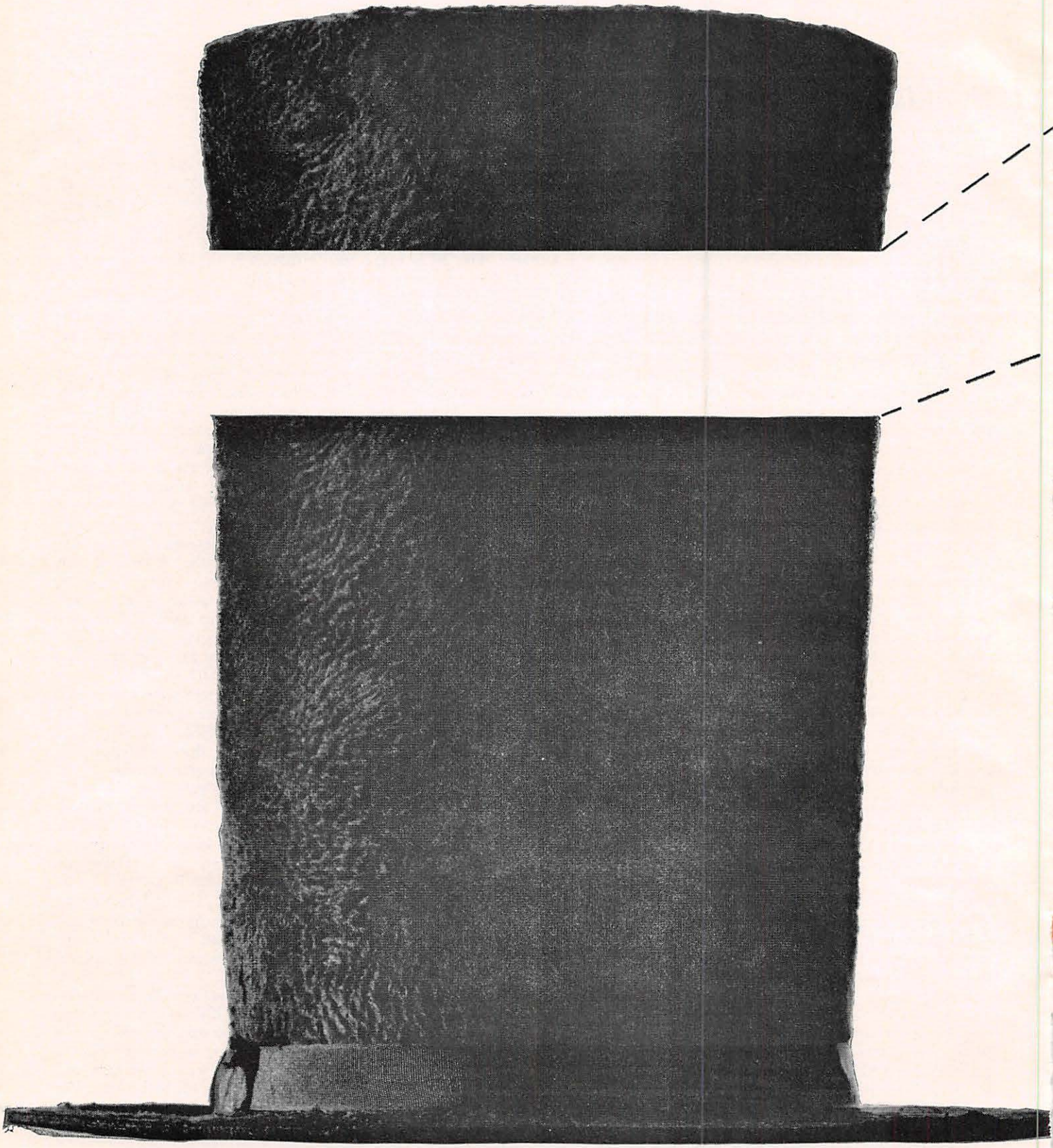
In conjunction with a welded rail laying program last year. RI installed PMC on 22 miles of line in northwestern Kansas and on 20 miles of line in Texas and New Mexico. In Kansas, PMC replaced 7300-ft coded DC track circuits in automatic block signal territory resulting in the elimination of 34 insulated joints.

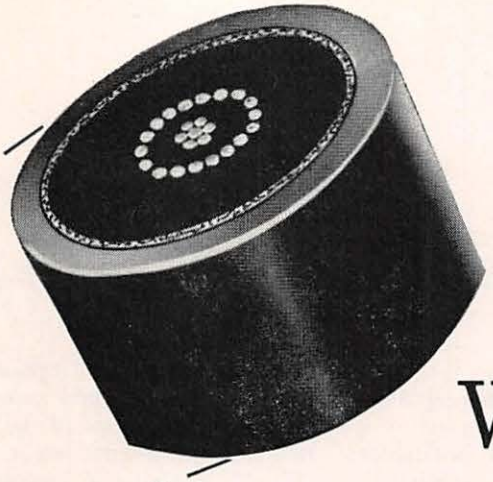
Johnson told how they overcame some problems with the Kansas installation. "It was in this first installation that we became aware that the transmitters were not the low consumptive type which could be used with primary type battery. This resulted in our installing storage battery with charging equipment at all transmitter locations. We also found that the junction boxes used to house the inductive couplers could not be set along the track outside the ties as had been presumed because of the unbalance developed by the difference in the lengths of leads in the leads in the pick-up loops. We overcame this by placing the junction boxes in the center of the track, but, as you can expect, another problem was created. Anything used to house signal apparatus becomes fair game so far as m/w machine operators are concerned, but with these boxes a coat of paint to make them identifiable helped considerably in cutting down damage. To keep the pick-up loops, normally No. 6 AWG insulated bondstrand, in proximity to the rails we devised drilling holes in Improved Fair anchors through which the loop wire was run.

"The installation in northwestern Texas replaced 8800 ft DC track circuits in APB-type (Absolute Permissive Block) signaling resulting in the elimination of 28 insulated joints and about 60 miles of line wire used for control circuits.

"In this northwestern Texas installation we adopted the standard of using the Thermite process of welding the bondstrand used as a bootleg connector to the rail and to the underground cable from the case to the bootleg. We also adopted the use of a clamp to hold the pick-up loop to the rail" Johnson said.

Pulse Modulated Control (PMC) has been used in signal application on 15 railroads covering 300.5 track miles of which 131.8 miles are in electrified ter-





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## *Control of signal aspects via the rails accounts for the greatest*

ritory with both AC & DC propulsion.

A description of the basic types of PMC applications was presented by P. E. Pierce, manager midwestern region, Marquardt Industrial Products Co.

"Control of signal aspects via the rails accounts for the greatest number of miles of PMC in service. Installations include two and three aspect signaling. One of the greatest attractions of PMC for signaling use is the elimination of insulated joints and line wire. For rail relay programs PMC offers a means of eliminating insulated joints, even at intermediate signal locations, as well as the retiring of line circuits used for signal control.

"Another form of aspect control which offers a savings is the provision for a fourth aspect, such as an approach medium aspect, needed for additional braking distance in lieu of signal respacing. Control of the additional aspect can be effected over the rails without resorting to the expense of additional line wire for approach medium control circuits.

"In a data transmission application, line wire circuits can be eliminated by using modulated track circuits for transmission of data while retaining coded track circuits for basic train detection and aspect control purposes. One version of this scheme involves normally de-energized coded track. The PMC normally transmits Mod #1 in both directions. Should the dispatcher align traffic in one direction or the other a Mod #2 is transmitted to energize the code in the proper direction. The absence of a PMC mod rate sends a block indication to the dispatcher" said Pierce.

"The format of applications using pulse modulated signals for the basic track circuit without changing modulation rates for aspect control is especially useful in electrified territory where not only the elimination of insulated joints is attractive, but additionally, removes the need for costly impedance bonds required to conduct traction current returns around insulated joints. Typically these installations use the pulse modulated transmissions to control not only intermediate signal, but also to provide track circuits through interlockings including detector track circuits. They are used to activate crossing protection installations in these territory, thus eliminating the multitude of insulated joints often found in crossing installations with complex controls. Centerfed track circuits are used where this configuration offers equipment economies.

"A somewhat unique application involves the use of PMC to remote control a manual block station. One installation makes use of leased lines to carry the PMC signals from the control point to the remote location. In addition to providing control and indication codes for the manual block signal, the PMC provides approach indication information also.

"PMC equipment is also being tested in Europe under conditions imposed by a 25 KV, 50 Hz electrification system. Somewhat less exotic conditions, but certainly conditions not offering the most hospitable situation for track circuit operations, are found in test sites around Great Salt Lake where an abundance of salt provides a difficult environment. Other tests include track circuits adjacent to high voltage lines, concrete tie effects, etc.

"PMC offers a system which transmits and receives information in both directions over the same section of track simultaneously with five channels available in each direction to transmit controls or indications. Thus most combinations of aspects in common use can be accommodated" Pierce concluded.

In speaking to the session, Chairman Albertson urged members to be cognizant of innovations that may be necessary on account of the introduction of high speed trains.

"Communications people should be especially knowledgable regarding the new specialized common carrier decision made by the FCC to the end that railroad communications people can advise their top managements regarding the advisability of entering this highly exciting new field. I can assure you that an excursion through the uncertainties of legal, accounting, engineering and management problems that confront the potential operator of one of these systems would make you substantially more aware of the difficulties railroad management has in running a railroad, satisfying its customers, keeping the employes happy and still hopefully making a profit.

## Committees issue specs for C&S manuals

## track mileage of pulse modulated controls

"One last point that you should address yourselves to is that of interchanging communications facilities. I know that this has been done on a small scale for years, but I am speaking of interchanging bulk communications between railroads, such as data, intercity dial facilities, etc. There are savings to be made in the elimination of unnecessary toll calls with the attendant loss of time and labor savings in establishing the connection. Further and vastly more important are the uses to which these services can be placed during emergencies. The railroads of the United States have within their properties the means to create a vast communications network if properly handled to serve the industry, business and the nation in times of emergencies" Albertson concluded.

**Committee A—Outside Plant Facilities.** Elimination of the following manual parts from the Communication Manual was approved: 1-A-31, 1-A-57, 1-A-72, 1-A-73, 1-E-5, 1-E-6, 4-21 and 4-22. Elimination of the following manual parts from the Signal Manual approved: 4, 25, 31, 171, 172, and 201. The following information reports were accepted: Chemical Brush Control-Dormant Type; Mesa Carbon Arrester; and Slow Moving Vehicle Emblem.

**Committee B—Radio and Microwave Systems.** The following specifications were approved for inclusion in the Communication Manual: J-4 Carrying Strap of manual part 12-13; Mobile Radio Teleprinter Equipment for Use in Railroad Radio Service; Minimum Performance Requirements for Extremely Short-Haul, Light-Density Microwave System; and Public Address System on Trains. The following reports were accepted as information: Government Activities Affecting the Status of Railroads with Respect to Radio; circulars pertaining to radio matters C&S-2.69, -2.73, -2.74, -275, -282, -283, -289, -295, -300, -302, -309, -310, -313 and -319; Statistics on Railroad Radio Authorizations, Installations and Microwave Point-to-Point Systems; Activities and Developments in Connection with Radio Services of other Organizations; Comparative 160-450 mHz Propagation Tests as Related to Remote Controlled Locomotive Systems in Irregular Terrain and Communication Considerations for Remote Control of Locomotives Using Radio Links; Methods of Determining the Transmission Quality of Waveguide/Antenna Installations for Microwave Applications; and Comparative Performance of Hot Standby (only) Versus Space Diversity and Cross-Band Frequency Diversity in Microwave Radio Operation.

**Committee C—Communications and Data Systems.** The following reports were accepted as information: Code Translators; Time Division Multiplex; Theory of a Universal Numbering System for PBX Operation; State of the Art in High-Speed Data Modems; Transmission Characteristics of Coaxial Cable Systems; Acoustical Coupling; Radio Control Using Railroad Telephone Dispatching Circuits; and Solid-State Automatic Telephone Exchanges.

**Committee D—Highway Grade Crossing Protection.** Manual parts 166, 263, 268 and drawings 1655D, 1697B, 1698B, 1730D, 1731D, 1732D, 1734C, 1735C, 1736C, 1737C, 1738C, 1739C, 1740C, 1741C and 1742C were approved to supersede subject matter in the Signal Manual. Elimination of drawings 1643F, 1645F, 1650D, 1700C and 1701A from the Signal Manual was approved. The following reports were accepted as information: Application of Numerous Track Frequencies in a Small Area; Assembling Data for Highway Crossing Signal Projects, Development in Highway Grade Crossing Protection; Methods to Improve Effectiveness of Railroad-Highway Grade Crossing Protection Devices; Experimental Marking for Highway Grade Crossings; Interconnection of Highway Grade Crossing Protection with Street Traffic Signals; Investigate Agreements Covering Crossing Protection with Outside Parties and Make Recommendations on Suggested Standard Clauses; 8953C Typical Circuits for Automatic Highway Crossing Gates; and 8090B Typical Circuits for Automatic Highway Crossing Protection.

**Committee E—Interlocking, Traffic Control and Block Signal Systems.** Manual parts 5, 83, 91 Appendix A, and 143 were approved to supersede subject matter in the Signal Manual. The report on Specified Elements of Train Hour Cost per Road Freight Train Hour, Class 1 Railroads —1968 was approved as information.

**Committee F—Car and Engine Control Systems.** Manual part 27 was approved to supersede subject matter in the Signal Manual. Reports on High Water Detector, Dragging Equipment Detector and Remote Control Switching System were approved as information.

**Committee G—Education and Training.** Accepted as information was the report stating that AAR Signal Training Lesson No. 8 Highway Crossing Protection has been completed and is being reviewed prior to publication. Also the proposal of a training and development manual for communication employees is being reviewed.

**Ad Hoc Committee to Study and Develop ACI Hardware Standards.** A specification on Automatic Car Identifications Hardware—Communications Interface was approved for inclusion in the Communication and Signal Manuals.

# Data systems men and managers

Lessons of the Sixties and forecasts of the Seventies were discussed by W. Graham Claytor, Jr., president, Southern, at last month's annual meeting of the Data Systems Division, AAR, in Atlanta, Ga. "For one thing, we know now that there are wide areas of business that cannot be automated with the computer. For another, we realize that management must give policy and usage guidance if systems and computer activity is to produce the greatest benefit," said keynote speaker Claytor.

"In many companies, including Southern, data processing and systems analysis are now properly regarded as a corporate service, a staff specialty of major departmental stature able to participate in management on an equal basis with traditional corporate departments."

One of the important concepts of the Sixties was that of data bases—founded on accurate data—and the idea of storing an element of data in only one place and assigning responsibility for it to one office. This eliminates duplication of effort and decreases possibility of error, but requires "an organization of our data files to allow any user to retrieve data and have it processed with a minimum of time and trouble. Learning to use this data base concept to best advantage will be one of the challenges of the 1970's.

"Another significant development of the Sixties was the real-time systems combining information-gathering communications networks and rapid data processing. At first we used data processing to save money. Now we see it also as a valuable tool for making money by improving our service and expanding our markets," Claytor said.

"Many of the new real-time systems are not intended to reduce personnel needs or control costs. They are meant to do things that people alone cannot do because of the sheer volume and speed of the operations required. Basically, these are new types of processes designed to help the railroads operate more effectively, and therefore more successfully, in every way.

"However, the return from this kind of computer and systems approach is not so immediately apparent as the savings from automating paperwork. It takes considerable management insight and fortitude to put the necessary money on the line and hold it there until the benefits begin to appear—and it also takes the money, which is not easy for railroads to come by these days. This is not, however, a risk but a necessary investment for our survival as an industry," Claytor said.

The Seventies will be "the decade of terminal-oriented real-time systems. By terminal-oriented I mean that computer capability will be directly available to many people throughout the railway via communication networks and individual computer terminals. These terminals should be put where the action is . . . to help the man on the front line of transportation do a better job."

The area of greatest potential gain for the computer is that of operations. "We need some significant refinements of the simulation techniques. We need to get the answers to 'what if' questions about changes in our way of doing things. You can set up, in the computer, a 'phantom railroad' where change can be controlled with precision. But it takes skilled operating people using your model effectively to turn this into the most useful reality," Claytor said. Although improvements have been made, there is a need to make simulation an easy-to-use, proven and immediate tool for the operating man.

Looking ahead in the Seventies, Claytor sees vast improvements in data bases and fuller cooperation by railroads in the matters of data capture and exchange. "For example, the project already underway to precode repetitive shipments with a single number that would allow quick and accurate computer generation of the data that is always the same on such shipments seems to me an idea of tremendous potential."

After citing Southern, SCL, L&N and IC computer direct inquiry systems for car tracing (rsc Sept. 1970 page 68), Claytor said that "railroads should be able to work out an automatic computer-to-computer exchange of common data for their own benefit and that of customers.

"Expanded interchange of data with shippers, possibly through mobile agencies and other offices equipped with computer terminals, can help improve our service and eliminate car delays caused by lack of timely information. Centralized waybilling may reduce our need for recapturing waybill information later for the computer.

"Data interchanges can develop between different modes of transportation, streamlining the movement of containers and other intermodal shipments. There is a possibility that direct data exchange will reduce the mountains of paperwork we exchange with regulatory agencies. And we may even be able to use the computer to untangle the complexities of transportation pricing.

"The technological capacity to do these things exists. How fully we realize their potential depends largely on how well we can work together for the common good of our industry and of transportation as a whole," Claytor said.

Six ways for management to obtain

## MANAGEMENT INFORMATION

One of the major lessons of the Sixties is that the communications gap must be closed between the manager and the data processing specialist or the systems analyst. Another lesson is that computers can be used to make money as well as save money.

Many railroads are closing the communications gap by bringing data processing up to full departmental status and participate in management on an equal basis with traditional corporate departments.

Data development—including the value of accurate data—was prime in the Sixties. For the 70's, the key will be data exploitation. Also, the 70's might be termed the decade of terminal-oriented, real-time systems. Computer capability will be directly available to many people throughout the railway via communication networks and individual computer terminals. Thus, managers at all levels will be directly involved in management information systems, and in computer usage.

# will work more closely in the 70's

*Management must give policy, usage guidance if edp gives greatest benefits.*

**W. Graham Claytor**

*Management scientists can make a large contribution to railroad efficiency.*

**P. B. Wilson**

the most computer capability were outlined by Robert P. Neuschel, senior partner, McKinsey & Co., Inc.

(1) Successful managers will master the computer on high payout uses, i.e., on profit-bearing and managerial activities.

(2) A balanced selection of computer applications is desired. Return on investment, while important, should be weighed along with length of project, distribution of work, users capability and data processing capability. "The number of projects should relate to the number of capable project managers and comprise a blend of low and moderate risk projects along with one or two high risk applications," Neuschel said.

(3) Increase involvement by key line management. If computer projects are to have meaningful reality with what makes the business run, line operating people must have the strong role in project identification, selection and development.

(4) Applications should be subjected to rigorous pre-evaluation including technical (within limits of computer technology and company resources), economic and operational feasibility.

(5) Cultivate tough realism on what can be done and how soon.

(6) "Bring the computer and decision-maker together where, with the use of relatively simple cause and effect models, the decision-maker can quickly determine the consequences of alternative courses of action," Neuschel said.

Railroads should concentrate on decreasing time for handling shipments rather than buy more and larger equipment, especially freight cars. Railroads can't buy enough cars to handle seasonal and normal loadings, said Prime F. Osborn III, president, Seaboard Coast Line.

Computer usage, said the luncheon speaker at the sixth annual meeting of AAR's Data Systems Division, can provide for rescheduling of cars, motive power and crews to obtain short trains operated frequently to improve service.

Data processing must be expanded to provide for current management supervision, traffic trends and aid in major decision-making beyond day-to-day operations, Osborn said. For example, computer capability can be of tremendous help in determining car and locomotive acquisitions, setting freight rates, determine if new yards are needed and, if so, where they should be located.

Data processing and systems analysts must "perfect what we are now doing. They should be overly cooperative and should inform managers of computer hardware capabilities," Osborn said.

"Exchange of waybill/car movement data offers our industry its greatest potential for cost reduction and service improvement," reported R. O. Hughes, director management services, Detroit, Toledo & Ironton, and chairman of the Data Systems Division committee on Interroad Procedures and Data Exchange. Under data exchange programs are included per diem settlements (30 railroads now participating), interline freight revenue settlement records and car repair billing. This latter program, including the price master list became available August 1.

The interline freight revenue settlement records program has been tested by nine railroads, and Hughes asked for authority to work with DSD people to develop a centralized tape exchange program similar to the per diem settlements exchange program.

"Illinois Central currently exchanges data on a point-to-point basis with Elgin, Joliet & Eastern and Grand Trunk Western in Chicago; Union Pacific at Omaha and at New Orleans with Louisville & Nashville and Southern Pacific," said George Pipas, vice-president communications and computer services. Transmission is via commercial telephone service using IBM 1050 data terminals.

Union Pacific has expanded its data exchange program since its inception in 1952 so that it now includes Burlington Northern, Chicago & North Western, Milwaukee Road, Norfolk & Western, Rio Grande, Rock Island, Santa Fe, SP and Western Pacific. One method "encompasses the overhead exchange of waybill passing records between railroad headquarters. This is primarily intended for traffic car location advice covering shipments which are routed via the UP," said J. L. Jorgensen, director management information services,

*Management will be closely involved in computer activity.*

**J. W. Germany**

Union Pacific.

"The exchange of operating train consists between carriers is similar to the overhead exchange except that the actual interchange of data occurs between roads at selected interchange points. The procedure may vary from the exchange of advance lists and/or card decks by messenger, by direct telegraph circuit, by point-to-point transmission via IBM 1050's equipped with dial-up data sets to transmission of advance switch lists via telecopier or facsimile transmission devices," Jorgensen said.

Both Pipas and Jorgensen cited the urgent need for standards to provide data field compatibility eliminating the need for reformatting or recoding by the receiving carrier.

Using selected waybill fields UP and SP are now in a pilot project of exchanging current passing information in a format that conforms for the most part to the standard exchange format recommended by DSD. Format and coding is compatible to be accepted by both roads for direct input to their computers for updating on-line car files.

The marriage of communications and computers has probably been offering the most potential from a technical standpoint. The development of minicomputers at this point in time is considered a technical success, perhaps not fully realized, said S. A. Alward, director, management information services, Louisville & Nashville.

In reviewing the lessons learned in the Sixties, Alward said that data processing systems were batch and analytical in nature and were primarily doing accounting work and traffic statistics. The next major progress from that was the transmission, normally on a point-to-point basis, of formatted car movement data which would then, after the fact, be read into the computer systems and files updated. This was a major accomplishment in that it introduced the disciplines necessary to the field that would have to be met to get the data in with a reasonable degree of correctness.

The third phase was to take the communications systems, in most cases torn-tape Teletype systems, and put them on-line, providing a message switching and limited data handling capability. The fourth phase is the marriage of all of the previous three phases into on-line data management systems. The effort has primarily been in the area of car control, Alward said.

In discussing lessons of the Sixties, P. B. Wilson, chief of cybernetic research and industrial engineering Canadian National, said: "The groundwork has been laid for major advances in the application of management science to our industry. Three factors are creating a strong stimulus and indeed pressure in this direction.

"First is the increasing complexity of our business and recognition that many of the problems which must be tackled are interfunctional. We are beginning to look at the railroad from a total systems viewpoint. The system is reaching out beyond the confines of any individual railroad and is embracing other railroads and our customers.

"Secondly, the railroads are faced with new developments in technology and are going through a phase of constant innovation. Railroads are no longer just reacting to changes in their environment, they are attempting to change their environment. They are trying out new things and they are experimenting. This is leading to a host of new problems which have not been faced before," Wilson said.

"Finally, we have the computer! In the past we have been constrained to some extent by the inadequacy of the information and tools available. Now almost every railroad is using modern communications and computer systems, and this is giving a new life to the development and application of management science techniques."

Relatively unmined areas of endeavor include corporate planning, competitive processes, human behavior and organization and cybernetic control. "Cybernetics is the science of control and while computers can—and occasionally do—lead to better control, in too many cases they are producing data which is of only limited help to management and not very suitable for management control.

"The railroads would certainly appear to have ideal conditions for cybernetic control. We have more complete control of all the elements involved in our operations than most other industries. The assembly of cars into trains and the subsequent guiding of these on fixed rails lend themselves to automatic methods. In the past we have been restricted in what we could do because of the diffuse nature of railroad operations and because of time lags in communications systems. Because of these factors, control has traditionally been carried out by means of an hierarchy of decentralized decision-making centers with consequent danger of suboptimum decisions and with very little overall control except after the fact. With modern communications and computer systems these inhibitions on control no longer exist and a much tighter and, if need be, automatic control is within our grasp," Wilson said.

"What have we learned over the last decade? The first lesson is that running a railroad is a lot more difficult than running a corner grocery store. Some attempts to apply sophisticated mathematical models have not been too successful simply because the real world was much too complex to accept the rigidities imposed by the mathematical formulation. It is of interest that most work which has been successfully implemented has had a basis of experimentation or its modern counterpart, simulation.

"Second, is the need for cooperation between the experienced railroader and the management scientist. Best results have been obtained when we have been able to marry the expertise of the management scientist with that of the experienced railroader.

"Third, it is beyond question that management scientists can make a large contribution to railroad efficiency.

"Fourth, many of the problems facing the industry are of an industry-wide and multi-industry nature. These problems not only require industry and shipper cooperation, but are often extremely complex requiring all the help that management science approaches can provide.

"Fifth, the railroad needs innovators and must provide the proper environ-

*Departments other than data processing should also use computers.*

**G. M. Leilich**

ment and encouragement for them," Wilson concluded.

The role of data systems is to support the mission of people directing the operations of the freight car cycle, namely to add value to a product by moving it from one point to another employing cars, crews, power and plant, profitably, reported G. S. Sines, director, information and control systems, Missouri Pacific.

"There are six elements to an information and control system that are critical to its successful utilization by planners and decision makers. It is these six elements that the systems designers and the transportation management must agree to, that they exist and that they will be pursued.

"The first element is that almost all information systems are capable of extending the planning horizon and providing more time for planning.

"The second element is that control systems are two-way. The system not only collects data and brings it before the decision maker, but is used by him to convey his instructions to the field where they appear in a procedurally convenient method that is compatible with the basic data collection mechanics," Sines said.

"The third element is that the system contains the transportation plan of operation. It contains the schedules of cars, trains, and yard engines, and also the empty car distribution plan.

"The fourth element is the capacity to monitor the execution of transportation actions against both specific instructions and the plan.

"The fifth element is the existence of an organization that will use the system. It isn't safe to assume because one occupies a certain position in the transportation hierarchy that he either has or exercises control over the subordinate levels that appear on the organization chart. One has to bring in as soon as possible people who are capable of performing the job from both an experience and aptitude level. In trying to accomplish the task prior to the implementation of the new information system several benefits accrue. They get to know the problem and what decisions they are to make. The new organization will rightfully regard their success as being tied to the new system and vice versa. They will use the information and control systems to accomplish these assignments. By being made aware that they are part of the new organization and that they are to express their problems to the systems people, they will hopefully look to the new system as something akin to salvation. The designers are then designing for real, warm, flesh and blood people —people who are facing realities.

"The sixth element is the development of the planning and control instruments," Sines said. He said it was essential to know that the users of information and control systems are actually using these systems.

"Information and control systems with their various planning and control reports; the procedural aspects including codes, displays and terminal devices; the unique office environment; and realistic problem scenario must be simulated using real yardmasters, car distributors, power distributors, etc., before you commence programming. I believe this is essential to getting the user sign off. This type of sign off is not only to get user agreement that the new system is procedurally acceptable, but that the new system will indeed produce the design objectives of reduced cost of operations and a higher level of transportation service," Sines concluded.

Computer systems to gain general acceptance by managers will have to give them what they really want and need for their daily work, reported R. R. Crane, group vice-president, Science Management Group, WOFAC Co. "A computer will have to fulfill three basic requirements: (1) an up-to-date and complete data base; (2) a simple man-machine interface; and (3) a built-in flexibility to cope with the ever changing conditions and exceptions in a dynamic business environment.

"Practical business solutions with present computers will place the human as the last link in the system. This will enable the computer to do the rough tuning of the problem such as summarizing and analyzing of the available data while it leaves the solution of the details, the fine tuning, to the manager. This way, significantly better outputs can be produced at a reasonable cost," Crane said.

Fourth generation computers—present third generation systems employ integrated circuits—will have large-scale integration of the electronic circuitry of entire systems. Fourth generation computer systems will consist of distributed information systems, management oriented languages, information centers and interactive systems for managers, data bank and central file concepts, time sharing and communications combining voice, data and pictures.

"In the Seventies we will see the development of true management information systems designed, written and used by managers. Use of the computer in dynamic decision making will be at all levels of management. There will be an absolute necessity for computers to justify their cost. Computers will be used for 'brainstorming' sessions and instantaneous answers to complex questions: what will happen if?" Crane concluded.

"The 1970's will be a decade for railroad industry exploitation of communications/computer systems on an interline basis," said J. W. Germany, general manager, system management services, Southern Pacific Transportation Co.

Speaking of the outlook for the 70's as compared to what happened in the 60's, Germany said: "The economic pressures of the 70's will certainly be felt much greater than in the 60's. Perhaps the 70's will bring dramatic changes in generations of computer, however, in large communications/computer systems, even if theoretically compatible, the change from one system to the next improvement poses major economic as well as physical impacts upon the industry.

"Hopefully the 70's will allow the railroads to measure performance on their movements on an interline basis and, more importantly, to provide a car scheduling system to aid in improving the performance and reliability.

"As more and more long range communications/computer systems are con-

ceived the demand for talented systems analysts will become even greater. Certainly the software houses themselves who desire to sell back to us will be our greatest competition for this type of scarce resource. This scarcity will demand that a greater portion of our activity be diverted to training in-house as opposed to training offered by vendors in the early 60's," Germany said.

"The thrust of the 60's was in the design and development era. The design era provided for the data input, the data corrective process that placed error correction back in the field level at time of input and developed accurate data files for exploitation. Having our data base established, our challenge of the 70' is data exploitation.

"The actual computer used in the 70's while having increased computing capacity per dollar, generally will require greater expenditure initially in order to attain their computer capacity. Multi-programming in such areas as foreground/background processing will become a standard requirement in order to exploit their potentials. Evaluation of software alternatives will be much more time consuming than was the case in the 60's.

"Communications offer a different challenge for the 70's. In SP's case, the 1960's saw our requirement for communications double. While this requirement was met with the installation of our own private microwave system, the 70's cannot tolerate the additional doubling of the capacity. Satellite communication, laser communication and coaxial cable communication all offer some promise for the future.

"Demand has outstripped the capability, in many areas, for common carriers to provide circuits, not to mention the increased cost.

"High reliability must be considered as a major objective in selection of the communication mode. Hopefully, with data interchange capability interline computer-to-computer exchange over high speed, highly reliable communication links will occur in the 70's at a reasonable cost," Germany said.

"The demand for technical people in order to carry out out objectives for the 70's will certainly place the greatest demand upon our recruiting skills.

"With the developed awareness of management of both the benefits and and cost of computer systems, the 70's will be an era where management will be closely involved in computer development, particularly communications/computer activity. With management's desire for improved reliability of rail service, a great part of the burden for obtaining the reliability and measuring the reliability will fall upon the computer activity of the 70's," Germany said.

***UMLER is 77% complete; and TRAIN is handling 4 million records monthly.***

**R. A. Petrash**

"Certainly the 1970's will face a greater demand for extreme close planning of expenditures, and while we may have our objective clearly in sight, constraints may prohibit attainment of those objectives. This will require a closer evaluation of each alternative to make certain that a least cost solution is attained while still bearing in mind the objectives that we have set for ourselves.

"The communications/computer system should support increased resource utilization in the company while at the same time minimizing the resources necessary to attain that objective. The pressures that are always attendant to diverting concentration from the objective are the problems that the designers face in the 70's," Germany concluded.

In commenting on the ASTRO report (America's Sound Transportation Review Organization), AAR president Thomas M. Goodfellow said: "Railroads are the only mode of general transportation required to pay the entire cost of constructing and maintaining the facilities they use, and at the same time pay taxes on them. To place all modes on a more even footing, ASTRO makes a number of specific recommendations.

"One is to exempt railroads from state and local property taxes on railroad rights-of-way, epecially since rail competitors don't pay similar taxes but have the Federal government reimburse local governments for lost revenue.

"Another is to establish a single transportation fund, to be used by all modes in furthering a balanced transportation system. And a third recommendation is to use the funds already available to eliminate highway-railroad grade-crossing hazards.

"ASTRO recommends loan guarantees for improvements and equipment. It calls for government creation of a non-profit corporation to acquire a 'free-running' fleet of general-purpose, unassigned freight cars. And it proposes a single agency to regulate all modes of transport with equality. A part of this would be revision of laws barring one-package transportation—combining land, air and water services," Goodfellow said.

"ASTRO recommends a Federal commitment of $100 million annually over the next 10 years for research into all phases of freight and passenger service.

"ASTRO endorses the idea that a Federally chartered rail corporation, properly funded and soundly managed can bring some realism into intercity rail passenger service while relieving carriers of their losses.

"Whether railroad problems are resolved through the recommendations of ASTRO or through nationalization, it's going to cost money, a lot of money. But it'll cost a lot less under the ASTRO proposals than it would under the great uncertainties and incalculable costs of nationalization," Goodfellow concluded.

In several areas, the railroad industry is making progress. For example, 80-85% of the interchange freight car fleet is equipped with automatic car identification labels, as of Sept. 15, reported Robert A. Petrash, DSD executive director. He said that 121 ACI scanners are installed, and that an AAR sponsored pilot project to check on accuracy of labeling is about to begin. Sylvania has donated two scanners for this test, which only awaits selection of a heavy-traffic, single-track location. Scanners will be installed so as to read both sides of passing trains.

The UMLER (Universal Machine Language Equipment Register) file of 2.1 million freight cars is about 77% complete. U.S. and Canadian roads have provided about 85% complete records of freight car descriptions, but only about 30% of private line cars are completed in the UMLER file, Petrash reported.

As for TRAIN (Tele-Rail Automated Information Network), the AAR's computer is handling about 4 million records per month from 64 railroads. Junction slips are being produced. Also, 12 railroads are reporting no-bill and overbill information. Volume is about 100 per day and the match is very good—only 2 or 3 reports per day do not match. Penn Central, for example, has installed a separate terminal to handle N-B/O-B information with TRAIN.

Also, Petrash reported that use of SPLC (Standard Point Location Code) will be mandatory Jan. 1, 1972. Also, route code files will be available from the AAR by mid-1971.

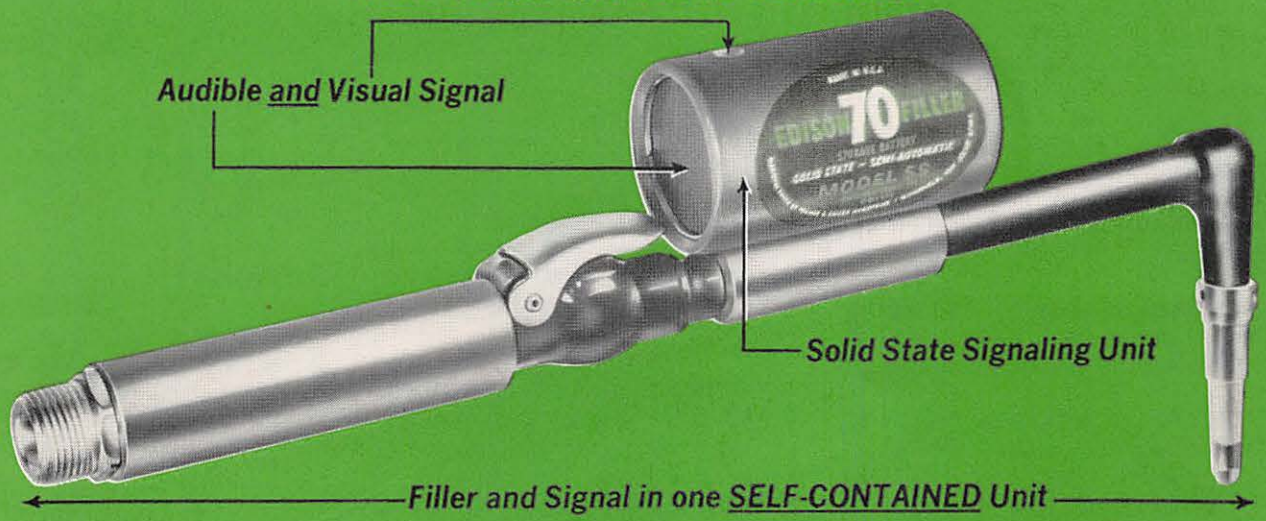
The first new EDISON product of the Seventies

# The EDISON 70

## SEMI-AUTOMATIC STORAGE BATTERY FILLER

*for Nickel-Cadmium or Nickel-Iron Batteries*

**WITH THESE EXCLUSIVE FEATURES:**




- Using a radically new design approach — and taking full advantage of today's advanced solid state technologies — Edison has engineered this filler to bring a new time-saving convenience, ease of handling and reliability to a routine, but essential, maintenance procedure. It's a modernization that has long been needed.
- A single, compact, light-weight unit fully replaces the separate filler and signal bell outfit formerly required. A light signal, in addition to the normal audible signal, assures that the operator will always know when the proper level is reached, even when working in exceptionally noisy surroundings. The entire signal unit operates on two, radio-type 9-volt dry cells, readily available anywhere.
- Two standard models of the filler are available:

  Model SS — with the short nozzle for signaling and communications batteries.

  Model SL — with a 30" nozzle for car batteries.

  *(Other sizes available on special order.)*

*For complete descriptive data, write us for a copy of Bulletin PB 1135.*

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**THOMAS A. EDISON INDUSTRIES**
**BLOOMFIELD, NEW JERSEY 07003**

McGRAW EDISON®

Circle 13 on reader service card

# People

**BURLINGTON NORTHERN:** **Arthur L. Essman,** former chief signal engineer Chicago, Burlington & Quincy and now director of signal engineering, is headquartered at St. Paul, Minn. **D. H. Thomsen,** formerly assistant to the signal engineer CB&Q, and now regional signal engineer, is headquartered at Chicago. **D. E. Peterson,** formerly assistant signal engineer Northern Pacific at St. Paul, and now regional signal engineer, is headquartered at Seattle, Wash. **Jewell R. Thomas,** formerly engineer of signals Great Northern and more recently special engineer signals BN, has retired.

**CHESAPEAKE & OHIO/BALTIMORE & OHIO:** **C. J. Hanna** appointed director of communications services and planning at Baltimore. **T. E. Dodds** appointed system signal inspector at Pittsburgh. **Robert P. Chandler,** signal draftsman, appointed signal application engineer at Huntington, West Va. **Orville Nealis, Jr.,** leading signal maintainer, appointed assistant signal supervisor Peru, Ind.

**CHICAGO & NORTH WESTERN:** **W. Lloyd Mansfield.** plant engineer communications, has retired.

**CHICAGO & WESTERN INDIANA:** **Frank W. Zabrockas,** supervisor bridges and building, formerly signal and electrical supervisor, has retired.

**ERIE LACKAWANNA:** **Oliver G. Carey,** general signal inspector, has retired.

**ELGIN, JOLIET & EASTERN:** **William K. Waltz,** signal engineer, appointed special assistant to chief engineer. **Bernard Anderhous,** communications engineer, appointed manager signals, communications and electrical engineering. **Jerome A. Harvey,** signal supervisor, appointed manager signals, communications & electrical facilities. **Arthur O. Edson,** signal supervisor appointed signal design testing supervisor. **Michael Palya, Jr.,** appointed acting signal supervisor. **Roy A. Senffner** appointed senior project engineer communications and electrical. **Robert P. Vellines** appointed communications engineer. All these men will be headquartered at Joliet. Ill.

**LOUISVILLE & NASHVILLE:** **Jerry A. Bischof,** project leader accounting, appointed manager systems support, management information services. **C. C. Rankin,** assistant signal supervisor, Chattanooga, Tenn., appointed signal inspector, Louisville, succeeding **L. W. Oliphant,** retired. **G. R. Campbell,** signal repair foreman, Louisville, appointed assistant signal supervisor, Chattanooga. **R. H. Brandt,** chief signal draftsman, appointed chief circuit designer, succeeding **R. A. Burge,** retired. **J. O. Higgins,** assistant circuit designer, appointed signal repair foreman. **J. D. Atchinson,** assistant engineer signals, appointed chief signal draftsman.

**MISSOURI PACIFIC:** **Robert L. Barley,** manager system analysis and programming, appointed manager transportation control system project with headquarters in St. Louis.

**PENN CENTRAL:** **S. Ishu** appointed assistant supervisor-communications and signals at Lancaster, Pa. **J. A. Crawford** appointed assistant field engineer-communications and signals and **E. T. Eveland** appointed staff engineer-communications and signals at Chicago.

**RICHMOND, FREDRICKSBURG & POTOMAC:** **Wendell J. Carlson** appointed assistant communications inspector at Potomac Yard, Alexandria, Va. **Thomas M. Pearson, Jr.** appointed communications technician, Potomac Yard.

**ROCK ISLAND LINES:** **T. A. Johnson** appointed assistant signal supervisor at Iowa City, Ia.

**ST. LOUIS-SAN FRANCISCO:** **Glenn F. Groff,** former communications and signals supervisor, now superintendent signals is headquartered at Springfield, Mo.

Arthur L. Essman
Burlington Northern

D. E. Peterson
Burlington Northern

**SOUTHERN:** **Arthur L. White Jr.** appointed assistant district signal and electrical engineer, Somerset, Ky. **W. Alton Lee,** signal and electrical construction supervisor Atlanta, appointed supervisor signal service center, deButts Yard Chattanooga Tenn. **Paul R. LeDoux** appointed signal and electrical supervisor Brosnan Yard, Macon, Ga. **Carey H. Waller** signal and electrical supervisor, Brosnan Yard, appointed signal and electrical supervisor Macon, Ga. **J. Kay Murphy,** telephone maintainer, appointed assistant supervisor communications at Valdosta, Ga.

**WESTERN MARYLAND:** **James M. German** appointed supervisor signals and communications at Hagerstown, Md. **George L. Baldwin** appointed assistant communication engineer at Hagerstown. **Henry L. Rank** appointed assistant supervisor signals and communications, Cumberland Md. **Charles W. Steininger,** supervisor signals and communications at Cumberland, has retired.

## Suppliers

**RELIABLE ELECTRIC CO.:** **David A. Gates** appointed district sales manager for the states of Illinois, Indiana and Michigan. He will be headquartered at Franklin Park, Ill.

**UNION CARBIDE CORP.:** **M. Warner Westland** appointed group marketing manager for arc carbon, electrical and mechanical, and chemical products of the carbon products division.

**VAPOR CORP.:** **J. Samuel Keller,** administrative assistant to the vice president, transportation systems division, appointed product manager for relays and electronics systems.

D. H. Thomsen
Burlington Northern

Glenn F. Groff
Frisco

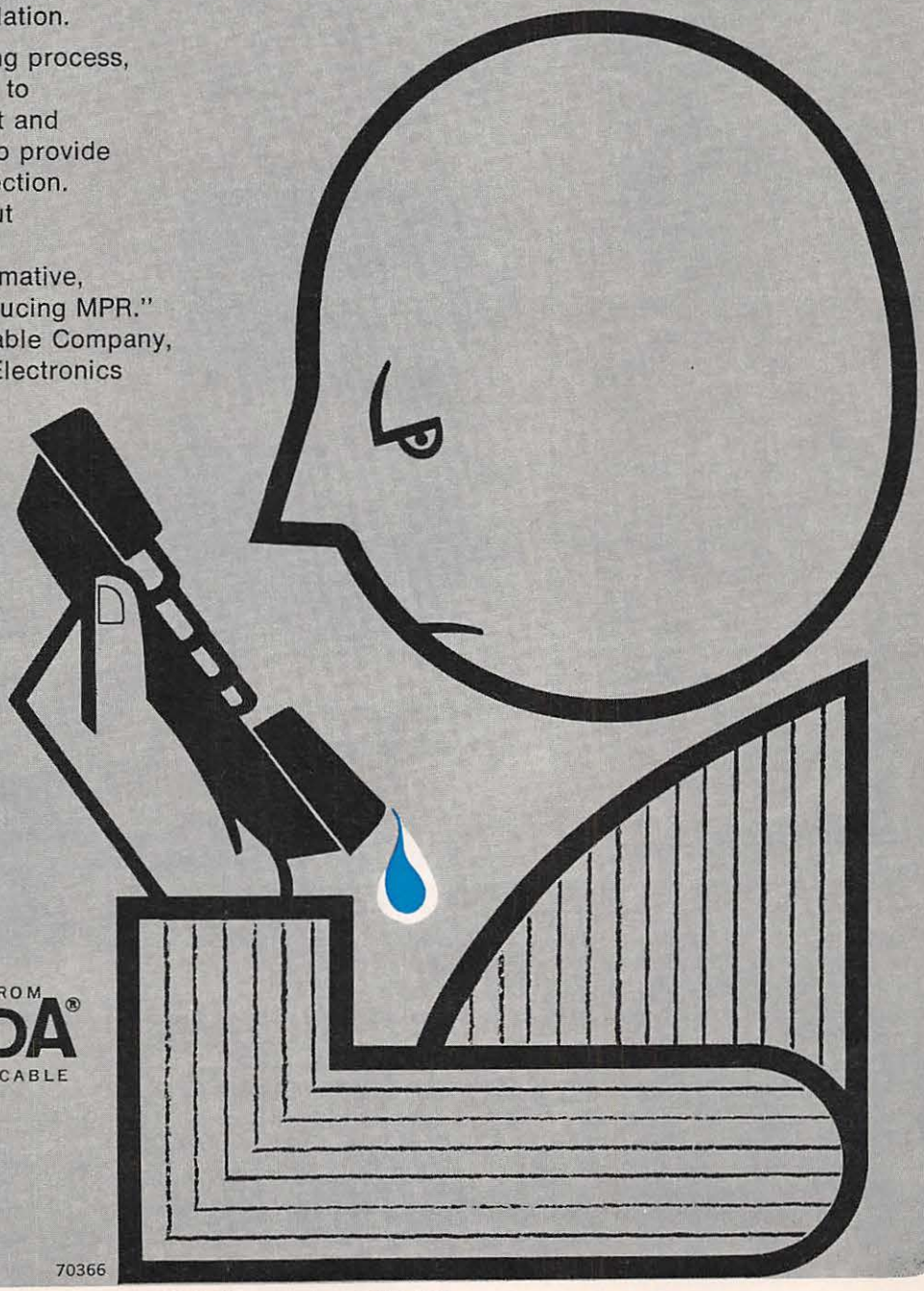
# Anaconda's New *MPR* stops moisture permeation

Moisture permeation, has always been one of the major problems in telephone cable.

Until now.

Now . . . Anaconda's Moisture Permeation Resistant cable (MPR™) virtually eliminates moisture permeation, moisture migration between shield and jacket, and shield corrosion, while retaining the advantages of simplified bonding harness installation.

By an exclusive bonding process, the shield is laminated to the polyethylene jacket and sealed at the overlap to provide positive moisture protection. Learn more today about Anaconda's new MPR. Get a copy of our informative, detailed folder, "Introducing MPR." Anaconda Wire and Cable Company, Communications and Electronics Division, Sycamore, Illinois 60178.

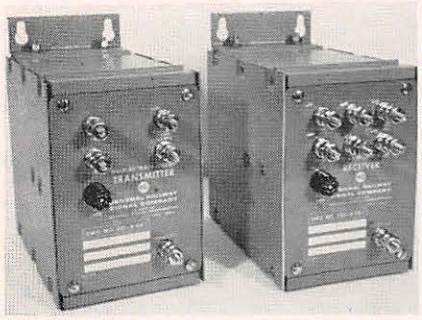


ASK THE MAN FROM
**ANACONDA®**
ABOUT MPR TELEPHONE CABLE

70366

Circle 14 on reader service card

# Product News



## Overlay circuits can control crossings (101)

Frequency Shift Overlay track circuits can control highway crossing protection devices without requiring the use of insulated joints. Frequency-shift modulated signals and new, unique receiver circuits combine to permit reliable operation under formerly impossible noise conditions.

A choice of 15 mutually compatible frequency channels ensures flexibility of application. New, exclusive, highly selective tuning circuits reject unwanted signals, and respond only to the proper FSO transmitter.

Transmitter and receiver characteristics are matched to track characteristics so that low frequency channels provide a track circuit length of 6,000 ft under normal ballast conditions (5 ohms minimum).

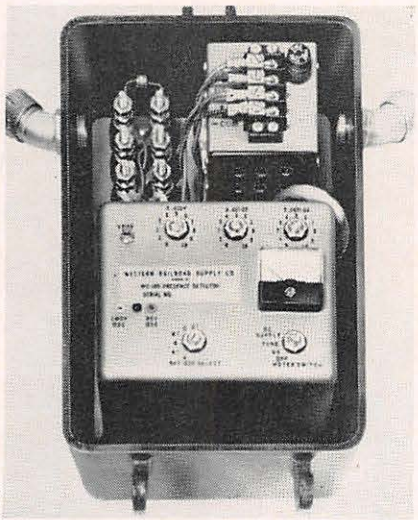
The receiver and transmitter can both be mounted in the same wayside case and use the same power supply. The active portion of a transmitter can be as far as 3,000 ft from its track connection; a receiver can be 6,000 ft from its track connection. Each unit—transmitter or receiver—can be shelf-mounted, wall-mounted any of three ways, or rack mounted in a B2 relay space. Protection against high-voltage surges is built into each FSO unit. *General Railway Signal Co.*

## Data system can handle 64 input points (102)

A data-input system capable of feeding information simultaneously from up to 64 keystations is the Keyplex system. It is designed to replace medium and large keypunch installations and accommodates a wide variety of data-preparation applications for a broad spectrum of computer users. The new system enables up to 64 operators to encode data onto computer-compatible magnetic tape.

Data entered at a keystation travels through a keystation multiplexer to the processor. The processor identifies the data with its point of origin and compares it in memory to determine whether the data is valid and proper. When the buffer of each keystation is filled, it is recorded on magnetic disk. Record size up to 400-characters is not restricted by the system and is dictated by the user's needs. The data is recorded in a predetermined location on the disk assigned by the supervisor's station.

Data retrieved from the disk is transferred to magnetic tape for processing by an on-site computer, or for communications to a remote location, or for print-out in a line or serial printer, or for processing in a variety of alternative methods depending on the user's computer system requirements. The seven- or nine-channel magnetic tape is compatible with most computers. *Honeywell Data Products Division.*



## New units power presence detectors (103)

Two compact, regulated power supply units are now available for use with the W-C 100 presence detector. Both units, the 91255-51A and the 91255-51B, have similar operating characteristics: input 106/130-volts, 60 Hz, output 12 ± 0.5 volts, 0.5 amp DC. However, the 51B has a relay which cuts off the DC output when the AC voltage drops below 103 volts.

Dimensions of the power units are 3″ x 3″ x 3″, small enough to provide for placement within junction box 1233-62C, along with the detector and terminal block. Besides powering the detector with which it is encased, the power supply can be used to energize another nearby detector. *Western-Cullen Division, Federal Sign & Signal Corp.*

## Derrick can top 55 ft line poles (104)

A new series of digger/derricks offer higher 3-stage reach; tops 55 ft poles; provides more lifting power, up to 14,000 lb capacity; handles diggers up to 10,000 ft/lb—and can double as an insulated two-man or one-man aerial device with controls at the bucket.

The new "G" series Polecat has a two-stage hydraulic boom and is offered with 3rd-stage fiberglass manual extension. Units can be corner, center or rear mounted on a heavy-duty truck chassis. Options and accessories include continuous rotation, lifting attachments, a wide choice of diggers, power-installed anchoring kits, pole puller, tamper and remote controls. *Pitman Manufacturing Co.*

## Data processing hardware is multi-programmed (105)

System Ten is a business data processor with on-line file capability that accomplishes multi-programming by hardware. System Ten offers a choice between on-line, real time processing

*(Please turn to page 38)*

# The first data modem was built by gosh-knows-who. This one's built by who-knows-how.

For 75 years, knowing how has been a company tradition as well as an engineering principle at Stromberg-Carlson. And a lot of our know-how is built into our S-C 835 75-, 110-, and 150-baud data modems.

Know-how creates: *simplified speed change.* The flexibility of our design of the 75-baud unit allows the basic modem to be adapted to 110 baud by a simple change of the filters. Changing from 75 or 110 to 150 baud necessitates only the change of the filters and the receiver assembly.

*Assured long-term maintenance-free performance.* The S-C 835 design, up to telephone-industry standards, results in gear that's at home in any environment. A modem that will perform with consistent excellence for you year after year.

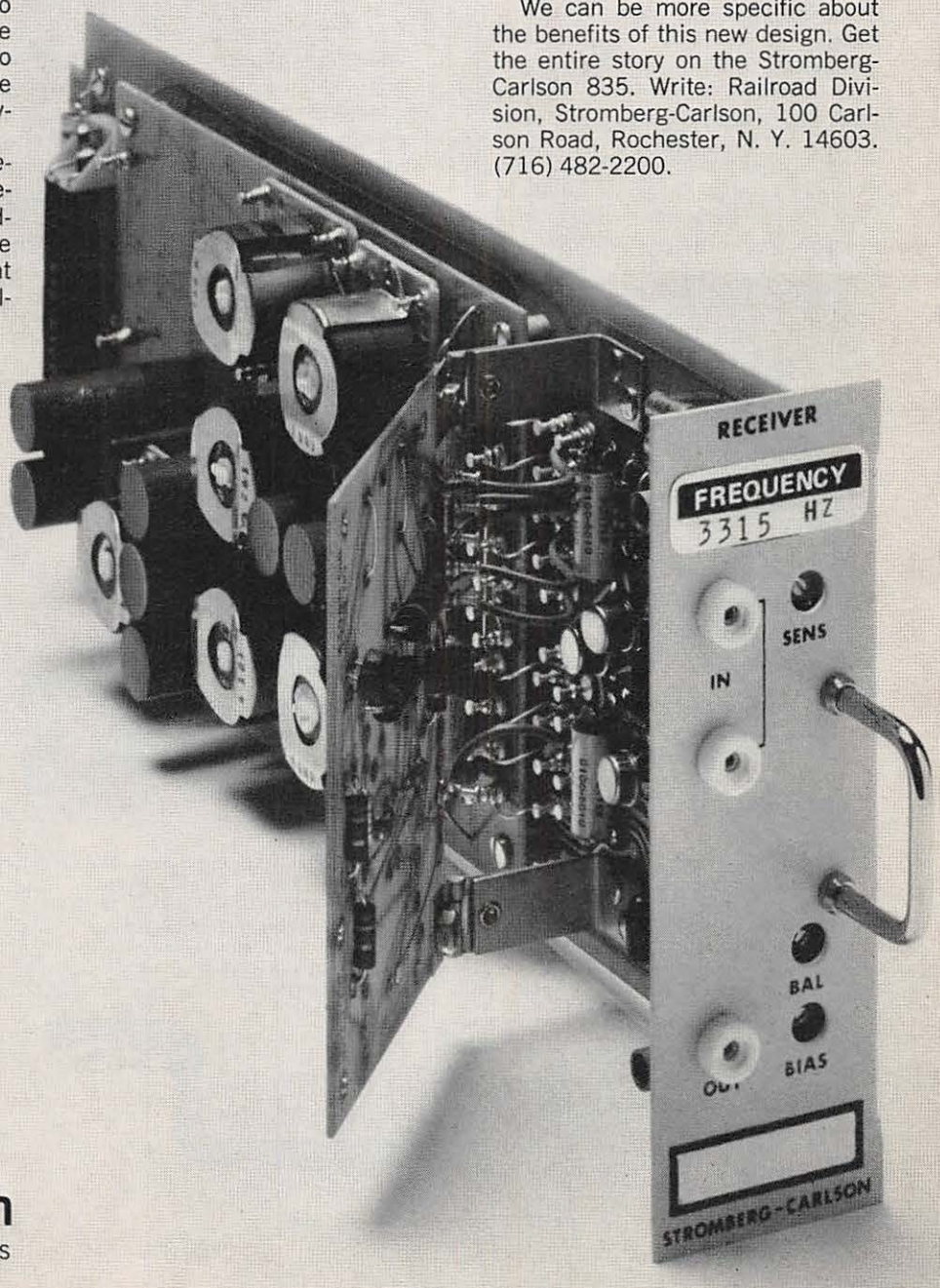
*Space-saving functional integration.* The interface card, mounted on the transmitter and receiver assemblies, eliminates separate space-consuming interface cards.

*Lower power consumption and heat dissipation.* A combination of solid-state and integrated circuits that lowers power consumption and heat-dissipation requirements, pushing reliability up and bringing equipment size down.

*Ease of testing and line-up.* Controls and test points are located on the front of the units, to facilitate alignment and testing of the equipment while it's working.

*And you'll like the price.*

We can be more specific about the benefits of this new design. Get the entire story on the Stromberg-Carlson 835. Write: Railroad Division, Stromberg-Carlson, 100 Carlson Road, Rochester, N. Y. 14603. (716) 482-2200.




**Stromberg-Carlson**
A Subsidiary of General Dynamics

# PRODUCT NEWS

*(Continued from page 36)*

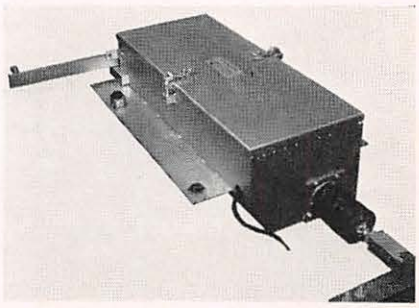
and batch processing by card, disc or tape. The simple, user-oriented workstations go almost anywhere a job requires. The terminals may be placed as far away as 2,000 ft from the central processor with just a two-wire line. System Ten communicates easily with other System Tens or other computer systems via common carrier telephone lines.

The nine System Ten components include: Model 20 processor—multiprograms by means of hardware control. The core memory storage is available in 10,000 character modules from 10 to 110 thousand characters of storage. The memory speed is 3.3 microseconds. Model 30 card reader—transfers information from punched cards into System Ten at 300 cards per minute. Model 35 card punch—converts System Ten data into punched cards for storage or additional processing. Model 40 disc drive—stores masses of data for use at any time. Up to 10 disc drives can be used for a maximum of 100 million characters of storage. Model 45 magnetic tape drive—stores and retrieves information on magnetic tape. Model 50 line printer—produces rapid printout of reports and forms at 450 lines per minute. The unit is a drum printer featuring a two-line buffer for maximum printing rates. Model 60 paper tape reader—operates at 300 characters per second. Model 65 paper tape punch—operates at 110 characters per second. Model 70 workstations—a simplified terminal that may be used as a typewriter when it is not communicating with the processor. The unit is designed for operator convenience and includes a work surface area, forms storage and operator personal storage area. *The Singer Co., Friden Div.*

## Line repeaters are compatible with T1 (106)

Models 3RU21A/B and 3RU22-A/B line repeater units are electrically compatible and mechanically interchangeable with Western Electric "T1" repeater models 201A/B and 205A/B respectively. Both units feature automatic equalization which eliminate the necessity for separate plug-in line build-out networks. Automatic equalization compensates for cable losses by automatically adjusting the gain and slope of each repeater unit to accommodate the attenuation of the previous cable section.

The 3RU22A/B line repeater unit includes secondary protection against lightning and power surges which supplements the standard primary protection externally provided. The 3RU21A/B line repeater unit is intended for applications where secondary protection is not required. *Lynch Communications Systems.*



## Yard switch machine is trailable (107)

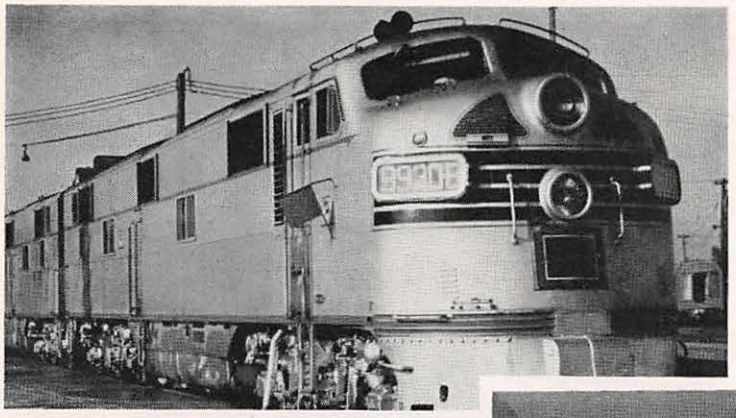
The YM-3B yard switch machine combines the features of a power switch machine and that of a trailable handstand. The new machine can be operated from either 3-phase 230/460-volt AC or single phase 120/240-volt AC. Control power can be 120 volts AC or 24 volts DC. Design permit either right or left-hand installation. The machine operates in two seconds. Normal and reverse indication contacts are built in. *Signal & Communications Division, WABCO.*

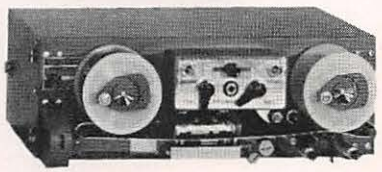
## Level meter is for testing carriers (108)

The CM-4 carrier level meter is designed for fast and accurate testing of CM-4 station carrier equipment. The carrier level meter provides an effective means of checking performance of existing systems. It may also be used to check the accuracy of engineering in determining repeater and line tap locations on initial installations.

Measurements range of the meter is in three scales. –30 db to –40 db, –5 db to +5 db at 116 KHz (Channel 4) and 0 to 170 volts DC. With the battery check button depressed the battery marking zone measures the charge of the internal battery.

This completely portable hand-held meter requires no external power source. Only one 9 volt battery is used to power the carrier level meter. The unit weighs less than 2 lb, measures 8" x 3" and is supplied with carrying case, battery, test leads, and operating manual. *Continental Telephone Electronics Corp.*



**when verbal communications become critical**

Railroads are becoming increasingly aware of the importance of maintaining accurate, permanent records of all verbal communications issued by railway dispatchers and other operating personnel. The availability of such records becomes of critical importance, particularly in cases of accident or freight loss.

The SoundScriber Communications Recording System provides a *proven* method of word-for-word recording which provides permanent, unalterable records which can be invaluable for verification of facts and for legal documentation. SoundScriber Recorders are used by these railroads: the Great Northern, the Northern Pacific and the Soo Line.

SoundScriber Recorders are economical, easy to install and operate — deliver years of reliable service. They provide 24 hours of continuous recording without changing tape reels. Write for complete details today. You may find that it makes good sense to fit SoundScriber Recorders into your communications system.

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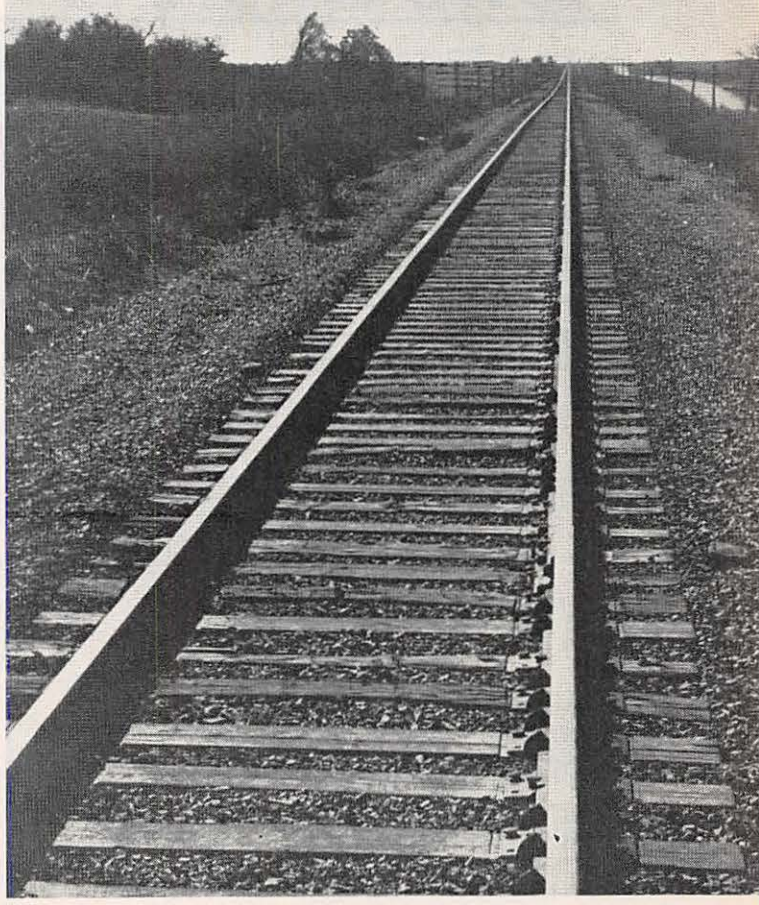
**SAFE**
**This stretch wasn't long enough!**

**UNSAFE**
**This stretch may be too long!**



# Our new rail-mounted SERVOSAFE® Hot Box Detective™ prevents axle burn-offs and derailments.

## It's a good thing to have on your railroad.

## But, for safety's sake, don't stretch a good thing!

Do you have long stretches of track without SERVOSAFE protection?

Recent studies have revealed that such factors as heavier car loadings, faster train speeds and greater accelerations have combined to increase the incidence of overheated journal boxes. This has prompted many railroads to review their spacing of hot box detectors. Up to now, the average spacing has been 25 to 30 miles apart along line-of-road. Under today's conditions, however, a hot box can develop in less than 25 miles and cause a derailment *between* detectors.

One solution becomes self-evident: closer spacing of hot box detectors for more protection. A SERVOSAFE system will not prevent a hot box—but it will detect, locate and warn of a hot box before the condition worsens into a dangerous, costly axle burn-off and derailment!

Will it cost you more to get this additional SERVOSAFE protection? Not really. Here are some reasons why not:

Our new Model 8808 SERVOSAFE system features patented rail-mounted scanners and solid state electronic data processing for the fastest, most precise detection of hot boxes. It allows remedial action to be taken *before* a failure occurs, and helps cut down the high costs of major salvage or replacement. The cost of installation and maintenance is appreciably reduced by eliminating the need for concrete foundations, special ties and expensive roadbed preparation. The rail-mounted scanner can be easily removed for maintenance or relocation. Finally, compare the cost of a SERVOSAFE with the $200,000 involved in just one derailment that could be prevented.

That's why most prudent, progressive railroad managements agree when we say, "More SERVOSAFE protection isn't costly—*lack of it is!*"

**Model 8808 SERVOSAFE Hot Box Detective** Rail-mounted scanner "looks" at journal bearing behind truck frame with a vertical, close-in target scan for greater uniformity and accuracy. Scanner is securely clamped to the rail (no drilling required). Accuracy is not affected by rail pumping, running or lateral movement.

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***Serving Safety Through Science***

*Since 1957, more than 1,000 SERVOSAFE Hot Box Detective systems have been put into service on 54 of the world's major railroads, and have compiled an unequaled record of safety improvement and cost reduction.*

Circle 18 on reader service card

MEMBER RPI

# News Briefs

## CN&W to FRA: let us drop train stop system?

Chicago & North Western has applied to the Federal Railroad Administration for permission to discontinue its intermittent automatic train stop system on single main track between Wyeville, Wis. and Butler and on two main tracks between Butler and Wicona, Wis., a total of 147.4 miles.

The proposed removal of automatic train stop devices will permit substantial economies in maintenance of signal equipment and locomotives and thus will reduce operating costs through elimination of facilities no longer required for present day train operations. The proposed removal will also facilitate greater flexibility in the use and scheduling of locomotives.

## FCC sets docket on special com services

Docket No. 18920 has been set by the FCC as the vehicle for an inquiry looking towards the formulation of policies and in proposed rule making concerning specialized common carrier services in the domestic public point-to-point microwave radio service. Date for filling petitions to deny and other pleadings involving applications is extended from the Nov. 2, 1970 date to one to be later set by the commission. (See table).

As of June 25, 1970, the FCC has received 37 applications covering 1,713 microwave stations to provide specialized common carrier services.

## FCC proposes 10 new radio channels to RRs

In a proposed rulemaking procedure, the FCC would permit 1 watt

## Specialized common carriers would blanket U.S.

| Applicant | Microwave Stations | System Coverage |
|---|---|---|
| Associated Independent Telephone Microwave Inc. | 17 | New Orleans–Houston |
| Astron Corp. | 56 | San Diego, Calif.–Everett/Seattle, Wash. |
| CPI Microwave Inc. | 26 | Ft. Worth–Dallas–Houston |
| Data Transmission Co. | 244 | Boston–San Francisco (35 major cities) |
| East Texas Transmission Co. | 5 | Dallas–Jacksonville, Texas |
| Interdata Communications Inc. | 11 | New York–Washington, D.C. |
| KHC Microwave Corp. | 24 | Looneyville–Houston, Texas, New Orleans, La. |
| MCI Kentucky Central Inc. | 34 | Kentucky, Ohio, Indiana, Illinois, Tennessee, Georgia, and Alabama |
| MCI Michigan, Inc. | 26 | Grand Rapids, Pontiac, Saginaw, & Detroit, South Bend, Ind., Toledo, Ohio |
| MCI Mid-Atlantic Communications Inc. | 37 | Atlanta, Ga.–Washington, D.C. |
| MCI Mid-Continent Communications Inc. | 57 | Minnesota, South Dakota, Iowa, Nebraska, Colorado, Kansas and Missouri |
| MCI Mid-South Inc. | 48 | Atlanta, Birmingham, Memphis, Little Rock, Jackson, New Orleans, and Mobile |
| MCI New England, Inc. | 17 | Boston–New York, Boston–New Bedford |
| MCI–New York West, Inc. | 11 | Chicago–New York |
| MCI North Central States, Inc. | 16 | Minneapolis–Chicago |
| MCI Pacific Coast, Inc. | 56 | San Diego, Calif.–Everett, Wash. |
| MCI St. Louis-Texas Inc. | 42 | St. Louis, Mo.–Dallas |
| MCI Texas East Microwave Inc. | 34 | Texas & Louisiana |
| MCI Texas–Pacific Inc. | 64 | Dallas, Tex.–Los Angeles, Calif. |
| Microwave Communications Inc. | 20 | Dubuque–Davenport, Ia. |
| Microwave Service Co., Inc. | 65 | San Diego, Calif.–Seattle–Everett, Wash. |
| Microwave Transmission Corp. | 15 | Los Angeles, San Francisco |
| Mitran Inc. | 22 | Chicago–St. Paul–Minneapolis |
| Nebraska Consolidated Communications Corp. | 130 | Minneapolis–St. Paul–Houston–Atlanta |
| New York-Penn Microwave Corp. | 67 | Chicago–Detroit–New York |
| " " " " " | 22 | Boston–Washington |
| Southern Pacific Communications Co. | 57 | San Diego, Calif.–Seattle, Wash. |
| " " " " | 95 | St. Louis–Los Angeles |
| Telephone Utilities Service Corp. | 36 | Texas |
| United Video Inc. | 94 | Minneapolis–Chicago–Dallas, Texas |
| " " " | 69 | Chicago–New Orleans |
| Western Tele-Communications Inc. | 26 | San Diego, Cal.–Seattle, Wash. |
| " " " " | 18 | Los Angeles–El Paso– Hobb, New Mexico |
| " " " " | 27 | Denver–Hastings–Lincoln–Omaha, Neb.–Sioux City, Ia. –Sioux Falls, S.D. |
| " " " " | 32 | Denver–Dodge City–Wichita–Topeka–Tulsa–Oklahoma City–Kansas City |
| " " " " | 8 | Sioux Falls, S.D.–St. Paul, Minneapolis |
| West Texas Microwave Co. | 31 | Ft. Worth, Amarillo, El Paso, Tex. |

portable radio remote control devices to be used by railroads in the 72-76 MHz band.

The Association of American Railroads and the Special Industrial Radio Services Association, Inc. (SIRSA), have filed petitions requesting amendment of the rules to permit operation of low power, portable remote control devices in the 72-76 MHz band in the Railroad and Special Industrial Radio Services. In support of its request for rule making, the AAR states that a need now exists for the use of radio in connection with the remote control of switching operations in yards and terminals. Signaling devices of this type are not compatible with ordinary voice communications and therefore cannot be operated in conjunction with existing yard and terminal radio systems on the same or adjacent frequencies in use in the same or nearby yards. The need for these systems relates to both the remote control operation of locomotives solely by radio and to the remote control of the locomotive by means of positive signals sent to the engineer in the cab. Examples of the use which remote control could be used include the safer coupling of cars by locomotives and also directing locomotives through hazardous or obstructed terminal driveways by the operator after he has altered pedestrian and vehicular traffic.

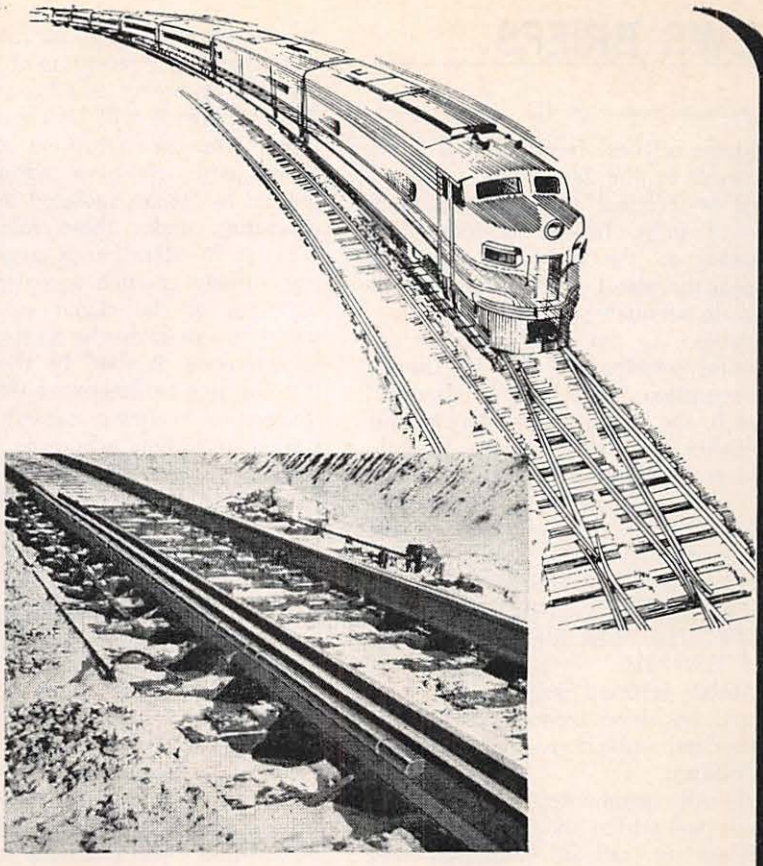
In proposing to amend its rules FCC said all transmitters operating on the subject frequencies would be required to operate solely within the boundaries or confines of the yard or terminal or area of heavy construction. Because changes in the area of radio operation may adversely affect safety operations of other licensees using these frequencies, the Commission will issue all licenses for specific and limited areas. Accordingly, a new application accompanied by evidence of frequency coordination will have to be submitted and approved by the Commission before operations can be commenced at a new construction site.

Tone, as well as voice transmissions will be permitted and multiple frequency systems may be authorized.

Use of the frequencies will be subject to the condition that no harmful interference be caused to reception of television channels 4 or 5.

With respect to the power limitation of 1 watt, the AAR states that a 5-watt limitation is the lowest power that would permit reliable communications in their proposed use of the frequencies. We, however, do not believe that such a proposal has been adequately justified. Permissible rail-

*(Please turn to page 42)*

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# NEWS BRIEFS

*(Continued from page 41)*

road use of these frequencies is to be confined to the limits of a railroad yard or terminal and in most cases, line of sight. In the absence of a showing to the contrary, it would appear that the 1-watt equipment will provide adequate signals.

Subject to the condition that no harmful interference will be caused to reception of television channels 4 or 5, the following frequencies are available for assignment to mobile stations in the Railroad Radio Service on a shared basis with stations in the Manufacturers Radio Service and the Special Industrial Radio Service: 72.44 MHz, 72.48 MHz, 72.52 MHz, 72.56 MHz, 72.60 MHz, 75.44 MHz, 75.48 MHz, 75.52 MHz, 75.56 MHz and 75.60 MHz.

Mobile stations proposed to be operated on these frequencies will be authorized subject to the following conditions:

(1) All communications must be conducted within the boundaries and confines of railroad terminals and yards.

(2) All operation on frequencies in the 72 and 75 MHz bands is subject to the condition that no interference is caused to the reception of television stations operating on Channels 4 and 5. Interference will be considered to occur whenever reception of a regularly used television signal is impaired by signals radiated by stations operating under these rules in the 72 and 75 MHz bands, regardless of the quality of such reception or the strength of the signal so used. In order to minimize the hazard of such interference, it shall be the duty of the licensee to determine whether interference is being caused by television reception wherever television receivers other than those under the control of the licensee, are located within 100 feet of any point where the stations licensed under these rules may be operated. In any case, it shall be the responsibility of the licensee to correct at its own expense, any such interference and if the interference cannot be eliminated by the application of suitable techniques, the operation of the offending transmitter shall be suspended. If the complainant refuses to permit the licensee to apply remedial techniques which demonstrably will eliminate the interference without impairment of the original reception, the licensee is absolved of further responsibility.

(3) Applications for use of any of the frequencies must be accompanied by evidence of frequency coordination among all of the services sharing the frequency.

(4) The maximum transmitter final amplifier plate input power that will be authorized is one watt; and each station authorized will be classified and licensed as a mobile station. Any units of such a station, however, may be used to provide the operational functions of a base or fixed station. The antennas of transmitters operating on this frequency must be directly mounted or installed upon the transmitting unit: Provided, however, That when permanently installed aboard a vehicle, antenna and transmitter may be separated as required for convenience in mounting. Horizontal polarization will not be allowed; and the gain of antennas employed shall not exceed that of a half wave dipole. The maximum bandwidth that will be authorized is 20 kHz. This frequency is available for voice or tone control transmissions and subject to the condition that interference will not be caused to the reception of television Channels 4 or 5. No protection from television interference will be afforded licensees operating on this frequency.


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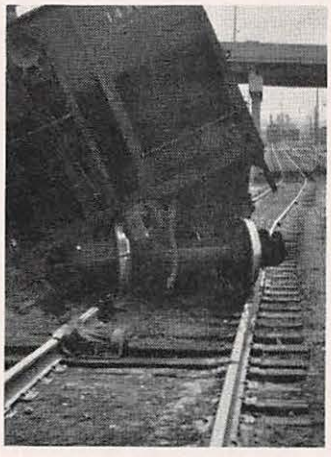

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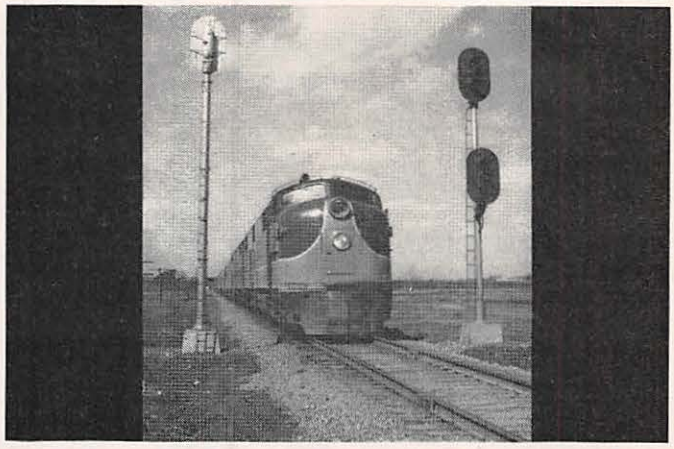

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## DT&I orders 18 ACI systems from Sylvania

Detroit, Toledo & Ironton has awarded a contract to Sylvania Information Systems for 18 KarTrak automatic car identification systems.

The electronic KarTrak systems will monitor and verify the location of the DT&I's nearly 5,000 freight cars, locomotives, and related equipment, as well as the thousands of specially equipped automotive parts and automobile cars operating over, originating, or terminating on the DT&I.

Charles L. Towle, president, DT&I, said that "through full implementation of ACI systems the DT&I will have an up-to-the-moment record of all of its rolling stock and will be able to provide faster, more efficient customer service, and at the same time, effect greater utilization of existing equipment, thus reducing operating costs."

Through automatic identification of each car, via the KarTrak systems, and cross verification through data processing equipment for full identification of its cargo and ultimate destination, the flow of supplies to and from auto manufacturers will be accelerated considerably, Towle said.

Prior to ordering the KarTrak systems, Towle pointed out, the DT&I had conducted extensive on-line tests of four KarTrak systems over a two-year period.

Robert Hughes, DT&I, director of management services, will be in charge of the installation and operation of the KarTrak units and integration of their information into the railroad's computers.

## Western Union could get TWX by Mar. 31, 1971

FCC has issued several directives concerning future tariff filings and accounting treatment that clear the way for Western Union Telegraph Co. to acquire Bell System's teletypewriter exchange service on March 31, 1971. By a 5-1 vote, FCC commissioners approved the sales of TWX to WU.

TWX currently produces about $80 million a year and Telex (WU's offering) produces about $58 million.

WU will pay AT&T about $85 million for TWX and about $5 million to independent telephone companies which own TWX equipment. Telex has 33,000 stations and TWX about 42,000 stations.

## SP looks at electrification

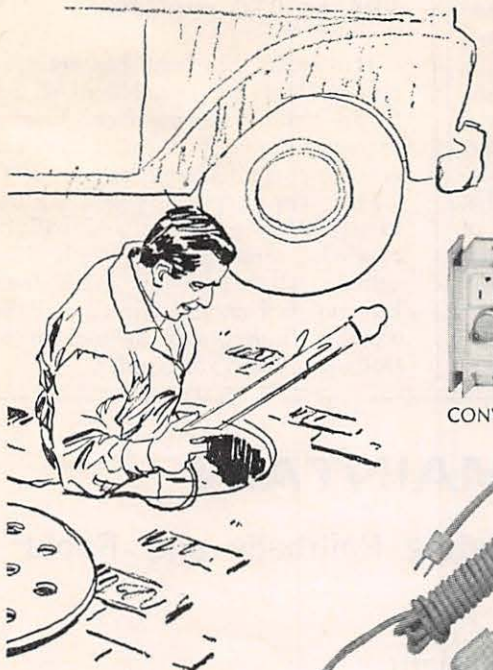
Southern Pacific is looking at about 800 miles of mainline electrification between Colton, Cal. and El Paso, Tex. Installation cost plus acquisition of motive power and required changes in other fixed facilities would run the total price tag to many millions. A decision on electrification is obviously one which SP will not easily make. Electrification was discussed by W. J. Jones, engineer, maintenance of way and structures, and Paul V. Garin, assistant chief mechanical officer, in a *Railway Age* interview with editor Luther Miller and senior editor Gus Welty. Excerpts from the interview follow:

SP has been working with utilities and BICC, an English company with world-wide catenary-construction credits, which was retained by SP and Southern California Edison to take a look at construction and costs.

A major aspect of the studies involves SP's purchase of power at the wire. Power would be single-phase, commercial-frequency.

Motive power is another major consideration. In Garin's view, both do-

*(Please turn to page 44)*

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# NEWS BRIEFS

*(Continued from page 43)*

mestic and foreign technology probably will play an important part in any ultimate design of an electric locomotive suitable for SP's needs.

Garin makes no secret of his belief that "the electric locomotive is the ideal locomotive for mainline operation." At the same time, he agrees that electrification would have significant side effects—on signaling and communications, on track maintenance, and on the whole way in which the railroad is operated.

There will be inductive interference problems with nearby transmission lines. All in all, there would be a new way of life ahead for maintenance and transportation people.

Jones and Garin agree that the inductive interference problems can be solved—though at some cost in modifying existing systems and installing new ones. Answers have to be found, for instance, to the overhead clearance problem in tunnels and in metropolitan areas where grade separation projects have produced one overhead structure after another along the line. Garin also asks, "If you look into the future, is the present signal and communication system going to be with us forever? Or will a new type system be developed?"

From a plant engineering standpoint, one of the most difficult problems may involve track maintenance. Jones points out that the use of off-track equipment, together with the installation of catenary support structures close to track may create new problems.

Perhaps the most extensive changes, however, could come in basic operations. Garin leads into this with a comment as to how electrification works—and why more people are becoming interested in it:

"The main advantage, of course, is what you realize in savings in the future. One stimulant to railroad interest is that the electric utilities are beginning to recognize that railroads are very attractive—from a load standpoint and also because railroad rights-of-way might be used for transmission-line installations. The fact that utilities are looking at the sale of power at the wire is a real incentive for railroads to take another look.

"It's true that electrification has had a rather sad history in this country, although it has worked out well in certain cases. Some roads use 25-cycle electrification, requiring special equipment, while other roads use d.c. electrification. Only Muskingum Electric is commercial-frequency. What Southern Pacific is looking at, of course, is commercial-frequency and a higher voltage than that generally used. We've had meetings with other railroads and DOT, and it has generally been agreed that 50,000, 25,000 and 12,500 volts could be national standards for railroad electrification. We're looking at a 50,000-volt system.

"It must be understood that electrified operation is a system. It's a different way of running a railroad, in which all operations have to be coordinated. On their new extension, for example, the Japanese are talking about computerized control of the electrified operation which will keep power demands within certain limits —so that demand charges for the power will stay within prescribed limits. One of the bugaboos of electrified operation is the demand charge, where your power rate is established by your maximum demand even though it's for a short period of time.

"One of the ultimate advantages of the electrified railroad is that it will have tremendous possibilities in the areas of automatic train operation and continuous surveillance. You can visualize an automated surveillance and monitoring system for trains en route, with electrical sensors on each piece of equipment to warn of any malfunction that might develop. You can even visualize freight cars in which you might have in-transit processing of materials by drawing power off the wire."

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## BN receives OK from FRA on CTC requests

Burlington Northern has received approval for the installation of two traffic control systems from hearing examiner Robert R. Boyd of the Federal Railroad Administration. Both CTC systems replace single-track automatic block signaling and will be controlled from Seattle, Wash. One system will extend 59 miles from Ephrata to Lamona, Wash., and the other is from South Bellingham to Delta Jct., Wash., 56.5 miles.

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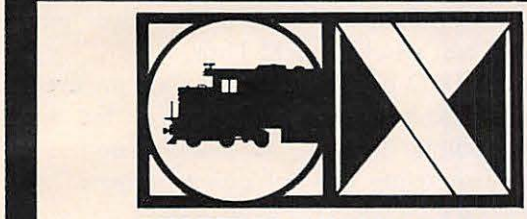

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# Editor's Corner

## Are you waiting for the Great Pumpkin?

This issue, arriving about the end of October, may be considered by some to be a Halloween trick or treat. We hope it's a treat. Managers everywhere anticipated that the introduction of the computer into their operations would solve their problems. They are like Linus (of "Peanuts" comic strip fame) who expects the arrival of the Great Pumpkin at Halloween to solve his problems. Although managers don't wait in cornfields, they often experience the same frustrations, that is, when the computer arrives, the solutions are not in the form they expect, and the answers are not easy to come by.

Fortunately, progress has been made, especially by railroad managers in adapting to computer usage and applications. Graham Claytor, Southern president, aptly remarked at the Data Systems Division, AAR, meeting in Atlanta: "For one thing, we know now that there are wide areas of business that cannot be automated with the computer. For another, we realize that management must give policy and usage guidance if systems and computer activity is to produce the greatest benefit. You data systems people know what the computer can do. It is up to us to work with you to reach a collective judgment as to what the computer should do."

To set the record straight—and not mislead readers any more—Peter Wilson, CN cybernetics chief, gave a very good description of cybernetics. The identification of cybernetics as computer usage "is a complete misconception of what cybernetics is. Cybernetics is the science of control and while computers can—and occasionally do—lead to better control, in many cases they are producing data which is of only limited help to management and not very suitable for management control."

### CYBERNETICS: BETTER CONTROLS

Canadian National has formed a cybernetics services department under Eric Stephenson, vice-president, who was formerly engineer of signals before he moved into the operating department and became vice-president at Winnipeg, Man. "The cybernetics department will eventually include all our computer operations, railroad signaling and communications and other activities concerned with better control," Wilson said.

This formation of a control department to include data processing, signaling, communications and even industrial engineering along with operations research was informally discussed by many persons attending the Data Systems Division and Communication & Signal Section, AAR meetings. The increasing role of combined communications/computer operations prompted many to remark that it would be of advantage to have C&S and Data Systems meetings run consecutively during the same week. Each met separately this year for 2½ days. Taken together, the meetings could cover one week, or even only 4 days. Advantages could include:

—Interest of both groups in exhibits, workshops and technical papers.

—Exhibitors would be able to reach the combined control group at one time, eliminating the expense of moving equipment and personnel to two meetings held in widely separated cities.

—Communications men, particularly, would be able to attend one meeting location and benefit from both groups.

—Closer coordination between the two groups (DSD and C&S) would benefit both.

—C&S and DSD people are very much involved in systems analysis, which says Claytor, is "the application of scientific methods to analyze, understand and develop or refine ways of doing business."

### NO MORE PRIVATE KINGDOMS

No longer can C&S men or DSD people remain separate in "ivory towers" or "private kingdoms" aloof from others on the railroad. "You are not in the communications or signal business for its own sake, but you are in it to play a key part in the efficient production of good transportation," said R. D. Spence, vice-president operations, system, Southern Pacific, at the Communication & Signal Section, AAR, meeting in San Francisco.

To put it another way, J. W. Germany, SP's general manager, system management services, said: "If you are in the middle of a swamp fighting alligators, it is hard to concentrate on the objective which is to drain the swamp."

So—let's get on with the business at hand, that of producing more efficient rail transportation service. Individually, there will be problems, but working together, Communication & Signals and Data Systems can perform miracles in the area of better controls to produce improved customer service.

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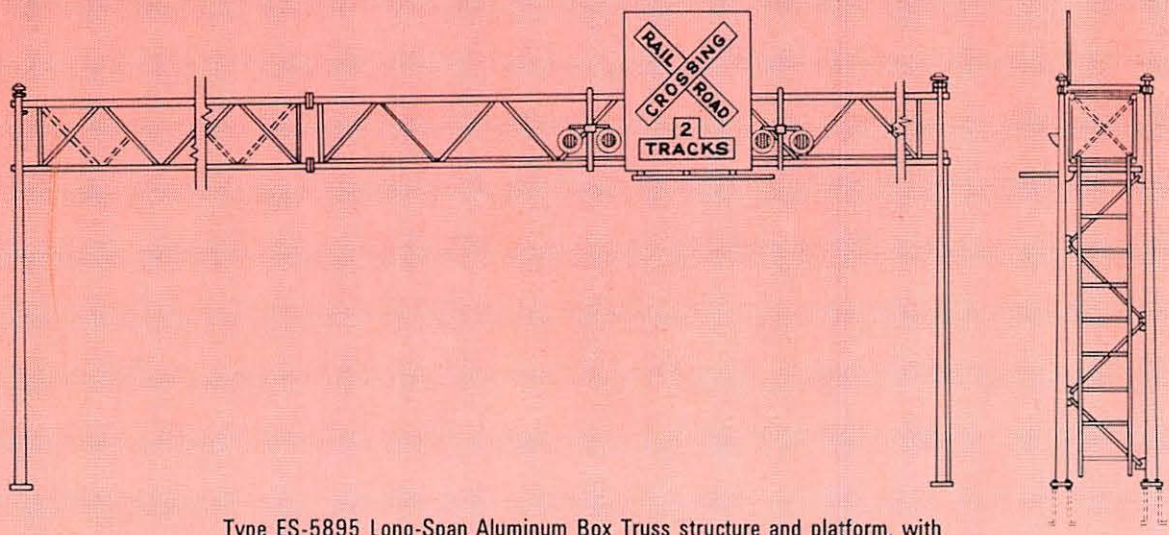


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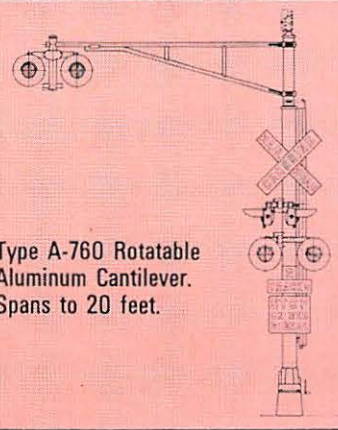

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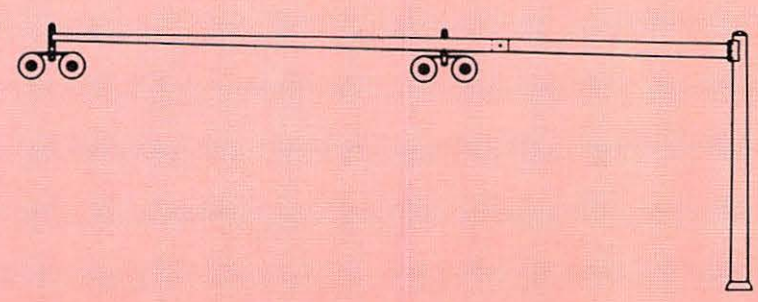

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